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(54) INSECT TRAP DEVICE AND METHOD OF USING

INSEKTENFALLE UND VERFAHREN ZUR VERWENDUNG

DISPOSITIF DE PIÈGE À INSECTES ET PROCÉDÉ D'UTILISATION

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Description

TECHNICAL FIELD

[0001] The present disclosure is related generally to an insect trap, more particularly, to a removable insect trap having a minimal footprint and an aesthetically pleasing design.

BACKGROUND

[0002] Flying insect pests have long been a nuisance and a health hazard. Since ancient times, insect traps have been used to eliminate flying insects, and hundreds of different traps have been proposed and developed over the centuries. There has always been a need to eliminate flies and mosquitos that inevitably find their way into homes. Recent US outbreaks of Eastern Equine Encephalitis, West Nile virus and harmful *E. Coli* infections, public health threats that can be spread by flying insects, have only increased this need. Because insects may see and be attracted to a combination of ultraviolet (UV) and visible light, an indoor insect trap may have its own UV and visible light sources. Insect traps commonly have a fluorescent tube that emits both UV and visible light to attract insects and a glue board to trap them. However, insect traps incorporating fluorescent tubes and the transformers that power them may be too large to fit wherever they're needed and too expensive to afford one for every room in the house. In addition, insects may contact the fluorescent tube and over time it may accumulate dust and insect debris, blocking the light and reducing the trap's effectiveness. Furthermore, the glue board may be difficult to remove and replace without touching trapped insects and adhesive.

[0003] US5915948 discusses an insect trap having a base mounted to a wall or other suitable surface. An insect attractant light source is inside the base, and a reflector is positioned adjacent a wall with the aim of the light from the light source being partially transmitted onto the reflector and then reflected away from the wall. US6393759 discusses an electronic fly trap apparatus having a housing with a cover placed over the top portion of the housing, and a flying insect access aperture through a portion of the cover. A light is positioned in the lower portion of the housing. Flying insects are said to pass into the apparatus through the access aperture, and are entrapped upon a sticky adhesive on a disposable sheet when they seek the light source.

SUMMARY

[0004] An insect trap device and methods of using the device are described herein. The insect trap may effectively attract and trap insects indoors and may be manufactured and sold at a lower cost than commercially available traps. The insect trap device may be smaller than competing indoor insect traps, and may be conven-

iently movable from one location to another. The insect trap device may be easier to clean and maintain without contacting trapped insects.

[0005] In a first aspect, the invention provides an insect trap as defined in the claims. In an embodiment of the first aspect, the enclosure includes a second opening, the second opening configured to allow light to emit from the enclosure. In an embodiment of the first aspect, within the base portion, the light is not manipulated. In an embodiment of the first aspect, the enclosure includes a third opening, the third opening configured to allow light to be received from base portion into the enclosure. In an embodiment of the first aspect, wherein the enclosure is configured to distribute the light in a predetermined pattern. In an embodiment of the first aspect, the enclosure includes: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein at least one of the first or second internal surfaces is configured to manipulate light. In an embodiment of the first aspect, at least one of the first or second internal surfaces includes an adhesive surface. In an embodiment of the first aspect, the rear housing portion has a concave surface, the concave surface configured to reflect light evenly within the enclosure. In an embodiment of the first aspect, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment of the first aspect, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion. In an embodiment of the first aspect, the divider portion includes a rear surface including translucent material and includes a front surface including an adhesive surface. In an embodiment of the first aspect, the second internal surface of the rear housing portion includes a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion. In an embodiment of the first aspect, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment of the first aspect, the rear surface of the divider portion is configured to receive the light from the second internal surface of the rear housing portion or directly from the lighting element. In an embodiment of the first aspect, the divider portion is configured to receive light at an oblique angle and spread across the divider portion. In an embodiment of the first aspect, the divider portion is configured to manipulate light. In an embodiment of the first aspect, the divider portion includes a planar or contoured shape, wherein

the shape of the divider portion is configured to optimize light distribution. In an embodiment of the first aspect, the base portion includes a protrusion and wherein the trap portion includes a recess for receiving the protrusion, wherein when the protrusion is received by the trap portion, the base portion and trap portion are engaged. In an embodiment of the first aspect, the trap portion includes a protrusion and wherein the base portion includes a recess for receiving the protrusion, wherein when the protrusion is received by the base portion, the base portion and trap portion are engaged. In an embodiment of the first aspect, the mounting portion includes an electrical plug having rigid conductors protruding substantially perpendicularly and directly from the rear surface of the mounting portion, wherein the conductors are insertable into an electrical power outlet. In an embodiment of the first aspect, the power source includes an electrical power outlet or a battery. In an embodiment of the first aspect, the lighting element includes a light emitting diode (LED). In an embodiment of the first aspect, the lighting element includes an ultraviolet (UV) LED and a blue LED. In an embodiment of the first aspect, the base portion includes an energy stabilizer configured to provide a constant voltage to the lighting element. In an embodiment of the first aspect, the energy stabilizer includes full rectifier circuit. In an embodiment of the first aspect, the base portion includes an opening, the opening configured to allow light to emit from the base portion to the trap portion. In an embodiment of the first aspect, the opening includes a transparent or translucent window. In an embodiment of the first aspect, the opening is proximate to the lighting element. In an embodiment of the first aspect, the trap portion includes an insect attractant. In an embodiment of the first aspect, the insect attractant is selected from the group consisting of: sorbitol, coleopteran attractants, dipteran attractants, homopteran attractants, lepidopteran, straight chain lepidopteran pheromones, eugenol, methyl eugenol, and siglure. In an embodiment of the first aspect, the coleopteran attractants include brevicomin, dominicalure, frontalinal, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and truncall. In an embodiment of the first aspect, the dipteran attractants include ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure. In an embodiment of the first aspect, the homopteran attractants include rescalure. In an embodiment of the first aspect, the lepidopteran attractants include disparlure. In an embodiment of the first aspect, the straight chain lepidopteran pheromones include codlure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone. In an embodiment of the first aspect, the insect attractant is integral to the enclosure. In an embodiment of the first aspect, the base portion includes a transmitter. In an embodiment of the first aspect, the transmitter includes a piezoelectric speaker configured to emit an insect-attracting sound. In

an embodiment of the first aspect, the insect-attracting sound includes frequencies in the range of approximately 0.2Hz to 240KHz. In an embodiment of the first aspect, the base includes a switch, the switch configured to allow a user to control a property of the trap. In an embodiment of the first aspect, the property is selected from the group consisting of: power, light intensity, light wavelength or frequency, light flickering, light patterns, and combinations thereof. In an embodiment of the first aspect, the switch includes a mechanical switch, an optical switch, an electronic switch, an electromechanical switch, or a Hall effect sensor. In an embodiment of the first aspect, the enclosure includes a reflective surface. In an embodiment of the first aspect, the adhesive surface is proximate to the reflective surface. In an embodiment of the first aspect, the base portion includes a circuit configured to a varying voltage to the lighting element, wherein the lighting element provides intermittent light to the trap portion. In an embodiment of the first aspect, the enclosure includes an outer surface, the outer surface at least partially surrounded by sleeve that is configured to reduce the amount of light emitted by the enclosure. In an embodiment of the first aspect, the at least one of the first or second internal surfaces includes a textured surface, the textured surface configured to increase the surface area of the enclosure. In an embodiment of the first aspect, the textured surfaces include ribs extending at least a portion of the length of the first or second internal surfaces. In an embodiment of the first aspect, the at least one of the first or second internal surfaces include a textured surface, the textured surface configured to increase the surface area of the enclosure. In an embodiment of the first aspect, the textured surfaces include ribs extending at least a portion of the length of the first or second internal surfaces. In an embodiment of the first aspect, the trap further includes: a light conducting body located proximate to the second internal surface of the rear housing portion, the light conducting body having a front surface and a rear surface and the light conducting body configured to receive light from the base portion and distribute the light in a predetermined pattern in the enclosure. In an embodiment of the first aspect, the front surface of the light conducting body further includes an adhesive material. In an embodiment of the first aspect, the rear surface of the light reflecting body is configured to reduce the amount of light from being emitted in a predetermined direction. In an embodiment of the first aspect, the light conducting body is tapered, having a thicker depth at a portion proximate to the base portion and a thinner depth at an opposite end. In an embodiment of the first aspect, the rear surface of the light conducting body is configured to reflect light into the light conducting body. In an embodiment of the first aspect, light is reflected multiple times within the light conducting body before being emitted into the enclosure. In an embodiment of the first aspect, the rear surface includes a rear cover or a matte layer. In an embodiment of the first aspect, the base portion further includes an optical enhancer, the

optical enhancer configured to direct the light into the trap portion in a predetermined pattern. In an embodiment of the first aspect, the optical enhancer includes a lens. In an embodiment of the first aspect, the enclosure includes an inner sleeve and the base portion includes an outer sleeve, the inner sleeve configured to align with the outer sleeve. In an embodiment of the first aspect, the outer sleeve includes a face plate having an opening. In an embodiment of the first aspect, the face plate opening corresponds to an enclosure opening, the openings providing an alignment means. In an embodiment of the first aspect, the inner sleeve is configured to be dropped into the outer sleeve. In an embodiment of the first aspect, the inner sleeve includes a tab for holding on to the inner sleeve. In an embodiment of the first aspect, the base portion includes a docking switch, the docking switch configured to activate the lighting element when the trap portion is correctly engaged with the base portion. In an embodiment of the first aspect, the trap portion includes a docking switch activator, the docking switch activator configured to activate the docking switch when the trap portion is correctly engaged with the base portion. In an embodiment of the first aspect, the docking switch includes a mechanical switch, an optical switch, an electronic switch, an electromechanical switch, or a Hall effect sensor.

[0006] In a further aspect, the invention provides a method of using an insect trap, as defined in the claims. The method preferably includes the steps of receiving an insect into the first trap portion through the opening. In an embodiment of this aspect, the method further includes: separating the first trap portion from the base portion; and disposing of the first trap portion, wherein the insect remains in the disposed first trap portion. In an embodiment of this aspect, the first trap portion is disposed without the human contact with the insect in the first trap portion. In an embodiment of this aspect, the first trap portion includes an adhesive surface and wherein the insect adheres to the adhesive surface. In an embodiment of this aspect, the base portion includes a docking switch, wherein the docking switch is configured to activate the lighting element when the first trap portion is correctly mounted to the base portion. In an embodiment of this aspect, upon separating the first trap portion from the base portion, the lighting element is powered off. In an embodiment of this aspect, upon separating the first trap portion from the base portion, the lighting element is partially shielded from emitting light. In an embodiment of this aspect, the method further includes: providing a second trap portion of an insect trap, wherein the second trap portion includes an opening; and mounting the second trap portion to the base portion. In an embodiment of this aspect, the first insect trap and second insect trap have different configurations.

[0007] Further objects, features, and advantages of the disclosure will be apparent from the following detailed description when taken in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0008] While the appended claims set forth the features of the present techniques with particularity, these techniques, together with their objects and advantages, may be best understood from the following detailed description taken in conjunction with the accompanying drawings of which:

Figure 1 is a front perspective view of a first informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 2 is a rear perspective view of a base portion of the insect trap of Figure 1 with a trap portion removed;

Figure 3 is an exploded view of the trap portion of the insect trap of Figure 1;

Figure 4 is a cross-sectional view through the insect trap of Figure 1;

Figure 5 is a cross-sectional view through a second informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 6 is a front perspective view of a third informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 7 is a rear perspective view of a base portion of the insect trap of Figure 6 with a trap portion removed;

Figure 8 is a perspective view, partly broken away, of the trap portion of the insect trap of Figure 6;

Figure 9 is a cross-sectional view through the insect trap of Figure 6 showing the interior of the base portion and the trap portion;

Figure 10 is a front perspective view of a fourth informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 11 is a rear perspective view of the insect trap of Figure 10;

Figure 12 is a front perspective view of a fifth informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 13 is a rear perspective view of the insect trap of Figure 12;

Figure 14 is a front perspective view of the insect trap of Figure 12 showing a trap portion partially removed from a base portion;

Figure 15 is a perspective view, partly broken away, of the trap portion of the insect trap of Figure 12;

Figure 16 is a cross-sectional view through the insect trap of Figure 12 showing the interiors of the base portion and the trap portion;

Figure 17 is an exploded view of a sixth informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 18 is a cross-sectional view through the insect trap of Figure 17 showing the interiors of a base portion and a trap portion;

Figure 19 is a cross-sectional view through a seventh informative embodiment of an insect trap in accordance with principles of the disclosure;

Figure 20 is an enlarged view of a portion of Figure 19;

Figure 21 is a perspective view of an embodiment of an insect trap in accordance with the invention, showing a trap portion removed from a base portion; Figure 22 is a cross sectional view of the insect trap of Figure 21; and

Figure 23 is an enlarged view of a portion of Figure 22.

DETAILED DESCRIPTION

[0009] To provide an overall understanding of the devices and methods described herein, certain illustrative embodiments will now be described. For the purpose of clarity and illustration, these devices and methods will be described with respect to insect traps used for indoor residential or commercial purposes. It will be understood by one of ordinary skill in the art that the devices and methods described herein may be adapted and modified as appropriate.

[0010] As described herein, an insect trap may include a light source, a removable enclosure with at least one opening, an adhesive surface at least partially within the enclosure, and optics to redirect light from the light source onto the adhesive trapping surface. The light source may include at least one light emitting diode (LED). The optics may be attached to the removable enclosure, and may be located at least partially within the enclosure. The optics may include optical enhancers such as a reflector, a lens and/or a diffuser. The insect trap may further include an insect attractant that emits sound or scent. The light source in the insect trap may deactivate when the removable enclosure is removed from the insect trap. The insect trap may further include rigid conductors protruding substantially perpendicularly and directly from a rear surface of the insect trap, wherein the conductors may be insertable into an electrical socket, whereby the insect trap may be mounted by inserting the electrical plug into an electrical socket. Alternately, the insect trap may include a battery power supply electrically coupled to the light source.

[0011] The insect trap may effectively attract and trap insects indoors and may be manufactured and sold at a lower cost than traditionally available insect traps. An insect trap with this example configuration may be smaller than competing indoor insect traps, and may be conveniently movable from one location to another. An insect trap with this example configuration may be easier to clean and maintain without contacting trapped insects.

[0012] With reference to the drawings, Figure 1 shows a front perspective view of a first embodiment of an insect trap, indicated generally at 110. The insect trap 110 includes a base portion 112 and a removable trap portion 114. A front surface 160 of base portion 112 may include

a switch 116, configurable to enable the insect trap 110 to be turned on or off by closing or opening the switch 116 as desired by the user. Alternatively, switch 116 may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Trap portion 114 includes a front housing 118 with at least one opening 120 in a front surface 168.

[0013] Figure 2 shows a rear perspective view of base portion 112 of insect trap 110 with trap portion 114 removed. Protruding from a rear surface 162 of base portion 112 are two electrically conductive prongs 122, adapted to mount insect trap 110 to a wall and provide power to insect trap 110 by inserting prongs 122 into a standard household electrical wall socket. Alternatively, base portion 112 may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion 112. While an electrical socket and batteries have been described as providing power to trap 110, any suitable power source may be used. Base portion 112 includes a lighting element such as one or more light emitting diodes (LEDs) 124. In some embodiments, the LEDs 124 include one that emits ultraviolet (UV) light and one that emits visible light (e.g., blue light). In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. Mounted in top surface 126 of base portion 112 may be a transparent or translucent window 128, shown partially cut away to reveal LEDs 124. Transparent or translucent window 128 protects the one or more LEDs 124 from dust and insect debris, and allows base portion 112 to be easily cleaned. In top surface 126 may be a slot 130, and on perimeter 164 of top surface 126 is a rim or upwardly directed protrusions 132.

[0014] Figure 3 shows an exploded view of trap portion 114 of insect trap 110. Trap portion 114 includes front housing 118 with at least one opening 120, a divider 134, and a rear housing 140. In some embodiments, divider 134 is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive 136 on a front surface 138. In some embodiments, the material and thickness of divider 134 and the material and thickness of adhesive 136 are selected to transmit a substantial proportion of the UV and visible light, for example greater than 60% of the light is transmitted through divider 134 and adhesive 136. In some embodiments, rear housing 140 includes a reflective-coated inside surface 142. Alternatively, the material and surface finish of rear housing 140 may be configured to reflect UV and/or visible light without a reflective coating. The rear housing 140 may include an opening 144 on its bottom surface 166, or alternatively opening 144 may be replaced by a transparent or translucent window (not shown).

[0015] Front housing 118 and rear housing 140 may be constructed from any suitable material, including a

thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, front housing **118** and rear housing **140** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **134** is substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, divider **134** may have ribs or other features that increase adhesive surface area and create regions of light / dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[0016] In some embodiments, front housing **118** may be coated with transparent, translucent or opaque adhesive on an inside surface **170** to provide additional insect trapping efficiency and capacity. In addition, front housing **118** may also have a reflective coating underneath the adhesive coating on inside surface **170** to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[0017] In some embodiments, front housing **118**, divider **134** and rear housing **140** are joined together at their perimeters with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **114** may also include insect attractants. For example, trap portion **114** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlure, gossypure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of the insect trap **110**. In such embodiments, the insect attractant is integral to trap portion **114**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on inside surface **170** of front housing **118** or through an opening **120** in front housing **118** or on front surface **138** of divider **134**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **110**.

[0018] Figure **4** is a cross-sectional, cut-away view through insect trap **110** showing the interiors of base portion **112** and trap portion **114**. As shown, divider **134** separates the trap portion **114** into a front enclosure **146** and a rear enclosure **148**. In some embodiments, base portion **112** includes a circuit board **150** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **122**, switch **116** and the one or more LEDs **124**. For clarity,

however, not all of the electrical connections are shown. The circuit board **150** may include electronic circuitry to receive ordinary household current from conductive prongs **122**, respond to the position of switch **116** and provide power to illuminate the one or more LEDs **124**. Circuit board **150** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to the one or more LEDs **124** when switch **116** is in the closed position, although it may also provide a varying voltage to the one or more LEDs **124** to provide a flickering light, which some species of insects find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **150** may provide power to the one or more LEDs **124** to provide both UV and visible light, although it may be configured to provide power to only the one or more UV LEDs **124** or to only the one or more visible light LEDs **124**, or to provide variable power to produce combinations of flickering UV and visible light. Circuit board **150** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in the base portion **112** to emit an insect-attracting sound. For example, the transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by an insect for approximately a 2 meter radius from trap **110**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **110**.

[0019] As shown, slot **130** in top surface **126** of base portion **112** and protrusions **132** on top surface **126** of base portion **112** engage with trap portion **114** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **114** to be securely but removably mounted to base portion **112**.

[0020] In the operation of insect trap **110**, conductive prongs **122** are inserted into a wall electrical socket, and switch **116** may be moved to a closed position. The one or more LEDs **124** emit light, represented by arrows, preferably UV and visible light, which is transmitted through window **128** in base portion **112**, through opening **144** in rear housing **140** of trap portion **114**, into rear enclosure **148**, and directly onto reflective-coated inside surface **142** of rear housing **140** and a rear surface **152** of divider **134**. In some embodiments, light is not manipulated in base portion **112** and is emitted directly into trap portion **114**. Reflective-coated inside surface **142** of rear housing **140** may include a concave shape

and may be configured to reflect the UV and visible light from the one or more LEDs **124** to distribute the light evenly onto rear surface **152** of the divider **134**, although the shape of the inside surface **142** of the rear housing **140** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light.

[0021] Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **152** of divider **134**, may be mounted to the rear housing **140** at or near opening **144**, and may replace or augment the role of the reflective-coated inside surface **142** of rear housing **140**. In some embodiments, the UV and visible light from the one or more LEDs **124** may directly strike rear surface **152** of divider **134** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across divider **134**, and may replace or augment the role of reflective-coated inside surface **142** of rear housing **140** or of the lens or lenses mounted to rear housing **140**.

[0022] Thereafter, light may transmit through divider **134** and adhesive coating **136** on its front surface **138**, and into front enclosure **146**. Light may be further evenly distributed by the light-diffusing properties of divider **134**, adhesive coating **136** on its front surface **138**, or both. A portion of the light entering front enclosure **146** continues through one or more openings **120** in front housing **118** and is emitted into the surrounding area where the trap is installed. Insects may be attracted to the UV and/or visible light emitted through adhesive coating **136** and one or more openings **120** in the front housing **118**, and fly or crawl into the one or more openings **120** and onto the adhesive coating **136**, where they become trapped in adhesive (e.g. from adhesive coating **136**). A user may observe trapped insects by looking through one or more openings **120** in front housing **118**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **114** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **114**, and replace it with a new trap portion **114**. The new trap portion **114** may have fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **110** will continue to efficiently and effectively attract and trap insects.

[0023] It should be appreciated that a benefit of trap **110** is the manipulation of light within trap portion **114**. In some embodiments, light manipulation occurs solely within trap portion **114**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **142**, divider **134** and adhesive coating **136**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating **136**. In some embodiments, light is manipulated to produce a predetermined

pattern on the adhesive coating **136** or within trap portion **114**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0024] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0025] An insect trap **110** of this configuration may accommodate a variety of different trap portions **114** that may be removably mounted to base portion **112**, each trap portion **114** being uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, the overall size and shape of trap portion **114**, and the size, shape, and orientation of the openings **120** in the front housing **118** of the trap portion **114**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **114** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **114** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **114** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0026] In some embodiments, base portion **112** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **112** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **112** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0027] As provided herein, openings **120** may be a variety of shapes and/or sizes. For example, openings **120** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **120** may be slots having straight, curved or undulating shapes or patterns. When openings **120** are circular, openings **120** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **120** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **120** are approximately 0.5mm to 15mm in diameter. When openings **120** are slot shaped, openings **120** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **120** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **120** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0028] In some embodiments, openings **120** cover all or a portion of trap portion **114**. For example, openings

120 may cover a range of approximately 1% to 75% of the surface area of trap portion **114**. In some embodiments, openings **120** cover approximately 5% to 50% of the surface area of trap portion **114**. In some embodiments, openings **120** cover approximately 10% to 30% of the surface area of trap portion **114**.

[0029] Figure 5 shows a cross-sectional view of a second embodiment of an insect trap, indicated generally at **210**. Insect trap **210** includes a base portion **212** and a removable trap portion **214**. Protruding from a rear surface **262** of base portion **212** are two electrically conductive prongs **216**, only one of which is shown, adapted to mount insect trap **210** to a wall and provide power to insect trap **210** by inserting prongs **216** into a standard household electrical wall socket. Alternatively, base portion **212** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **212**. While an electrical socket and batteries have been described as providing power to trap **210**, any suitable power source may be used. Base portion **212** includes a lighting element such as one or more LEDs **218**. In some embodiments, LEDs **218** include one that emits ultraviolet (UV) light and one that emits visible light (e.g., blue light). In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight.

[0030] In some embodiments, mounted in a top surface **220** of base portion **212** is a transparent or translucent window **222**, shown partially cut away to reveal LEDs **218**. Transparent or translucent window **222** protects the one or more LEDs **218** from dust and insect debris, and allows base portion **212** to be easily cleaned. Top surface **220** of base portion **212** may include a slot **224**, and on perimeter **270** of top surface **220** are upwardly directed protrusions **226**.

[0031] Trap portion **214** includes a front housing **228** with at least one opening **230** and a light-conducting body **238**. In some embodiments, light-conducting body **238** includes a front surface **254**, an adhesive coating or an adhesive layer **234** on the front surface **254**, and a rear cover **248**. In some embodiments, the material and thickness of adhesive layer **234** are selected to transmit a substantial proportion of the UV and visible light, for example greater than 60% of the light is transmitted through adhesive layer **234**. Light-conducting body may be tapered and configured to receive light through its bottom surface **240** from the one or more LEDs **218** and deflect and evenly distribute the light (e.g., through front surface **254** and adhesive layer **234**). Rear cover **248** may be configured to prevent light from escaping through the back, top and side surfaces of light-conducting body **238**. As provided herein, any suitable light-conducting body may be used.

[0032] Front housing **228** may be constructed from any suitable material, including a thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, front housing **228** is con-

structed by injection molding or by other suitable manufacturing techniques.

[0033] The front housing **228** may also be coated with transparent, translucent or opaque adhesive on an inside surface (not shown) to provide additional insect trapping efficiency and capacity. In addition, the front housing **228** may also have a reflective coating underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **228** and light-conducting body **238** may be joined together at their perimeters with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method.

[0034] As shown, front housing **228** and light-conducting body **238** together form a front enclosure **246**. Light-conducting body **238** may be tapered (e.g., thicker at a bottom surface **240** and thinner at a top surface **242**), and may be constructed from any transparent material that conducts UV and/or visible light, such as acrylic or polycarbonate plastic. The inside surfaces (not shown) of rear cover **248** may have a reflective coating to reflect light back into light-conducting body **238** and through its front surface **254**, thereby increasing its light-transmitting efficiency. Light-conducting body **238** may also have facets or other features of varying size, depth, and density on front surface **254** to enhance its light-transmitting efficiency.

[0035] Alternatively, in some embodiments, light-conducting body **238** has facets or other features on its front surface **254** and is not tapered. Light-conducting body **238** with microscopic facets or other features on its front surface **254** is commonly referred to as a Light Guide Plate, although the facets or other features may also be larger and still function effectively.

[0036] Alternatively, in some embodiments, light-conducting body **238** may not have an adhesive coating, and light conducting body **238** and rear cover **248** may be part of the base portion **212**. In such embodiments, trap portion **214** may include a transparent or translucent back plate (not shown) with an adhesive coating on its front surface, attached at its perimeter to the front housing **228**.

[0037] The materials of the trap portion **214** may also include insect attractants. For example, trap portion **214** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalinal, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlure, gossypure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of the insect

trap. In such embodiments, the insect attractant is integral to trap portion **214**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on an inside surface **250** of front housing **228** or through the at least one opening **230** in front housing **228** or on front surface **254** of light-conducting body **238**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **210**.

[0038] In some embodiments, base portion **212** includes a circuit board **252** having a programmable processor or chip (not shown) for executing commands, electrically connected to the conductive prongs **216** and one or more LEDs **218**. For clarity, however, not all of the electrical connections are shown. Circuit board **252** may include electronic circuitry to receive ordinary household current from conductive prongs **216** and provide power to illuminate the one or more LEDs **218**. Circuit board **252** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to one or more LEDs **218**, although it may also provide a varying voltage to the one or more LEDs **218** to provide a flickering light, which some species of insects find attractive. For example, light flickering frequencies in the approximate range from 0.05Hz (e.g., to mimic the breathing rate of large mammals), to 270Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **252** may provide power to the one or more LEDs **218** to provide both UV and visible light although it may be configured to provide power to only the one or more UV LEDs **218** or to only the one or more visible light LEDs **218**, or to provide variable power to produce combinations of flickering UV and visible light. Circuit board **252** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **212** to emit an insect-attracting sound. For example, the transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals), to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by an insect for approximately a 2 meter radius from trap **210**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **210**.

[0039] As shown, slot **224** in top surface **220** of base portion **212** and protrusions **226** on top surface **220** of base portion **212** engage with trap portion **214** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **214** to be securely but removably mounted on base portion **212**.

[0040] In the operation of insect trap **210**, conductive prongs **216** are inserted into a wall electrical socket, and

one or more LEDs **218** emit light, represented by arrows, preferably UV and visible light. The light from one or more LEDs **218** may transmit through window **222**, enter the thicker bottom surface **240** of tapered light-conducting body **238** and repeatedly reflect off of its front surface **254** and its rear surface **256**. In some embodiments, light is not manipulated in base portion **212** and is emitted directly into trap portion **214**. A portion of the reflected light may transmit through front surface **254** of the light-conducting body **238** to provide an evenly-distributed light onto and through adhesive coating **234** and into front enclosure **246**. The light may be further evenly distributed by refractive and light-diffusing properties of adhesive coating **234** on front surface **254** of light-conducting body **238**. A portion of the light entering the front enclosure **246** continues through one or more openings **230** in front housing **228** and is emitted into the surrounding area where the trap **210** is installed. Insects may be attracted to the UV and/or visible light transmitted through adhesive coating **234** and through one or more openings **230** in the front housing **228**, and fly or crawl into one or more openings **230** and onto the adhesive coating **234**, where they become trapped in the adhesive. The user may observe trapped insects by looking through one or more openings **230** in front housing **228**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **214** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **214**, and replace it with a new trap portion **214**. The new trap portion **214** may have fresh adhesive-coated surfaces and light-directing surfaces, ensuring that the insect trap **210** will continue to efficiently and effectively attract and trap insects.

[0041] It should be appreciated that a benefit of trap **210** is the manipulation of light within trap portion **214**. In some embodiments, light manipulation occurs solely within trap portion **214**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., light-conducting body **238**, front surface **254** and rear surface **256**, and adhesive coating **234**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating **234**. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating **234** or within trap portion **214**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0042] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some em-

bodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0043] An insect trap **210** of this configuration may accommodate a variety of different trap portions **214** that may be removably mounted to base portion **212**, each trap portion **214** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **214**, and the size, shape, and orientation of the openings **230** in front housing **228** of trap portion **214**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **214** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **214** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **214** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0044] In some embodiments, base portion **212** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **212** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **212** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0045] As provided herein, openings **230** may be a variety of shapes and/or sizes. For example, openings **230** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **230** may be slots having straight, curved or undulating shapes or patterns. When openings **230** are circular, openings **230** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **230** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **230** are approximately 0.5mm to 15mm in diameter. When openings **230** are slot shaped, openings **230** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **230** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **230** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0046] In some embodiments, openings **230** cover all or a portion of trap portion **214**. For example, openings **230** may cover a range of approximately 1% to 75% of the surface area of trap portion **214**. In some embodiments, openings **230** cover approximately 5% to 50% of the surface area of trap portion **214**. In some embodiments, openings **230** cover approximately 10% to 30% of the surface area of trap portion **214**.

[0047] Figure 6 shows a front perspective view of a third embodiment of an insect trap, indicated generally at **310**. Insect trap **310** includes a base portion **312** and a removable trap portion **314**. In some embodiments, front surface **360** of base portion **312** includes a switch **316**, configurable to enable insect trap **310** to be turned

on or off by closing or opening switch **316**, as desired by the user. Alternatively, switch **316** may be configured to control other features such as light intensity, combinations of light wavelengths, different flickering frequencies or modes, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Trap portion **314** includes a housing **318** with at least one opening **320**.

[0048] Figure 7 shows a rear perspective view of base portion **312** of insect trap **310** with trap portion **314** removed. Protruding from a rear surface **362** of base portion **312** are two electrically conductive prongs **322**, adapted to mount insect trap **310** to a wall and provide power to insect trap **310** by inserting into a standard household electrical wall socket. Alternatively, base portion **312** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **312**. While an electrical socket and batteries have been described as providing power to trap **310**, any suitable power source may be used. Base portion **312** includes a lighting element such as one or more LEDs **324**. In some embodiments, the LEDs **324** include one that emits ultraviolet (UV) light and one that emits visible light (e.g., blue light). In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. Mounted in top surface **326** of base portion **312** may be a transparent or translucent window **328**, shown partially cut away to reveal LEDs **324**. Transparent or translucent window **328** protects the one or more LEDs **324** from dust and insect debris, and allows base portion **312** to be easily cleaned. Upwardly directed protrusions or a rim **330** protruding from perimeter **364** of top surface **326** of base portion **312** may serve to secure trap portion **314** in place during use, although any other form of attachment may be substituted that allows trap portion **314** to be securely but removably mounted to base portion **312**.

[0049] Figure 8 shows a perspective view, partly broken away, of trap portion **314** of insect trap **310**. Trap portion **314** includes housing **318**, which forms an enclosure with one or more openings **320**, and a transparent or translucent adhesive coating applied to one or more inside surface **334**. In some embodiments, the material and thickness of housing **318** and the material and thickness of the adhesive coating are selected to transmit a substantial proportion of the UV and visible light, for example greater than 60% of the light is transmitted through housing **318** and the adhesive coating. Housing **318** may be constructed from any suitable material, including a thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, housing **318** is constructed by injection molding or by other suitable manufacturing techniques.

[0050] As shown, housing **318** includes ribs **336** or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmis-

sion of insect-attracting light into interior **370** of trap portion **314**. A sleeve **338**, configured to reduce the amount of light emitted by outside surface **368** of housing **318**, covers outside surface **368** of housing **318** except for a bottom surface **366** and at one or more openings **320**. Sleeve **338** may be constructed from any suitable material, including a thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, sleeve **338** includes a reflective coating on one or more of its inside surfaces, allowing sleeve **338** to direct more light through adhesive-coated inside surfaces **334** of housing **318** and further enhance the insect attracting and trapping efficiency and effectiveness. In some embodiments, sleeve **338** is replaced by a coating configured to reduce the amount of light emitted by outside surface **368** of housing **318**, or by the coating applied over a reflective coating, applied to outside surface **368** of housing **318**, except for bottom surface **366**.

[0051] The materials of the trap portion **314** may also include insect attractants. For example, trap portion **314** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that increases the insect-attracting efficiency of the insect trap. In such embodiments, the insect attractant is integral to trap portion **314**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on inside surface **334** of housing **318** or through opening **320** in housing **318**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **310**.

[0052] Figure **9** is a cross-sectional view through insect trap **310** showing the interiors of base portion **312** and trap portion **314**. In some embodiments, base portion **312** includes a circuit board **340** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **322**, only one of which is shown, switch **316** and the one or more LEDs **324**. For clarity, however, not all of the electrical connections are shown. Circuit board **340** may include electronic circuitry to receive ordinary household current from the conductive prongs **322**, respond to the position of switch **316** and provide power to illuminate the one or more LEDs **324**. Circuit board **340** may include an energy stabilizer such as a full wave rectifier filter circuit or any other circuit that provides steady voltage to one or more LEDs **324** when switch **316** is in a closed position, although it may also provide a varying voltage to one or more LEDs

324 to provide a flickering light, which some species of insect find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 250Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **340** may provide power to one or more LEDs **324** to provide both UV and visible light, although it could be configured to provide power to only one or more UV LEDs **324** or to only one or more visible light LEDs **324**, or to provide variable power to produce combinations of flickering UV and visible light. In some embodiments, circuit board **340** may be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **312** to emit an insect-attracting sound. For example, the transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by an insect for approximately a 2 meter radius from trap **310**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **310**.

[0053] In the operation of insect trap **310**, conductive prongs **322** are inserted into a wall electrical socket and switch **316** may be moved to a closed position. The one or more LEDs **324** emit light, represented by arrows, preferably UV and visible light, which transmit through at least one window **328** in base portion **312** and through bottom surface **366** of housing **318**. In some embodiments, light is not manipulated in base portion **312** and is emitted directly into trap portion **314**. A portion of the light continues within the enclosure, up one or more sides **372** of housing **318**, and out through adhesive-coated inside surfaces **334**. Another portion of the light continues through bottom surface **366** of housing **318** and into the enclosure, where it illuminates adhesive-coated inside surfaces **334**. A portion of the light entering housing **318** continues through openings **320** and is emitted into the surrounding area where the trap is installed. Insects in the area are attracted to the UV and/or visible light transmitted through openings **320** and fly or crawl into openings **320** and onto adhesive coated inside surfaces **334**, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through openings **320**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **314** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **314**, and replace it with a new trap portion **314**. The new trap portion **314** may have fresh adhesive-coated inside surfaces

334, housing **318** has a clean bottom surface **366** through which the UV and/or visible light is transmitted into trap portion **314**, and the transparent or translucent material of trap portion **314** has not been degraded by prolonged exposure to UV light, thereby ensuring that insect trap **310** will continue to efficiently and effectively attract and trap insects.

[0054] It should be appreciated that a benefit of trap **310** is the manipulation of light within trap portion **314**. In some embodiments, light manipulation occurs solely within trap portion **314**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., housing **318** and adhesive-coated inside surfaces **334**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **314**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0055] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0056] An insect trap **310** of this configuration may accommodate a variety of different trap portions **314** that may be removably mounted to base portion **312**, each trap portion **314** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **314**, and the size, shape, and orientation of openings **320** in housing **318** of the trap portion **314**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **314** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **314** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **314** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0057] In some embodiments, base portion **312** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **312** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **312** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0058] As provided herein, openings **320** may be a va-

riety of shapes and/or sizes. For example, openings **320** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **320** may be slots having straight, curved or undulating shapes or patterns. When openings **320** are circular, openings **320** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **320** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **320** are approximately 0.5mm to 15mm in diameter. When openings **320** are slot shaped, openings **320** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **320** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **320** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0059] In some embodiments, openings **320** cover all or a portion of trap portion **314**. For example, openings **320** may cover a range of approximately 1% to 75% of the surface area of trap portion **314**. In some embodiments, openings **320** cover approximately 5% to 50% of the surface area of trap portion **314**. In some embodiments, openings **320** cover approximately 10% to 30% of the surface area of trap portion **314**.

[0060] Although as shown in the embodiments of Figures 1-9, the trap portion mounts on a top surface of the base portion, other configurations may also work effectively. For example, Figures 10 and 11 show a fourth embodiment of an insect trap, where the trap portion mounts to the front of the base portion.

[0061] Figure 10 is a front perspective view and Figure 11 is a rear perspective view, both showing the fourth embodiment of an insect trap, indicated generally at **410**. Base portion **412** mounts and is provided power by plugging into a household wall electrical socket. Alternatively, base portion **412** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **412**. While an electrical socket and batteries have been described as providing power to trap **410**, any suitable power source may be used. In some embodiments, base portion **412** includes a circuit board (not shown) having a programmable processor or chip (not shown) for executing commands.

[0062] A lighting element such as one or more LEDs **414** may be mounted on a cross-shaped protrusion **416** protruding from front surface **418** of base portion **412**. Alternatively, LEDs **414** may form a protrusion themselves. While shown as a cross-shaped protrusion, the mounting surface and/or LED **414** configuration may be any desired shape. Trap portion **420** includes a housing **450** of translucent or transparent material with one or more adhesive-coated inside surfaces **422** and one or more openings **424**. In some embodiments, the material and thickness of housing **450** and the material and thickness of the adhesive are selected to transmit a substantial proportion of the UV and visible light, for example greater than 60% of the light is transmitted through housing **450** and the adhesive coating. Trap portion **420** may

include a coating configured to reduce the amount of light emitted by the one or more outside surfaces 452, on one or more outside surfaces 452 except for at the one or more openings 424 and at opening 426 in rear surface 428. As shown, opening 426 is a cross-shaped cavity 454, but may be any desired shape. For example, cross-shaped protrusion 416 on front surface 418 of base portion 412 may engage with a recess in cross-shaped cavity 454 in rear surface 428 of trap portion 420 to removably attach trap portion 420 to base portion 412. In this configuration, therefore, trap portion 414 mounts in front of base portion 412.

[0063] In the operation of insect trap 410, base portion 412 is plugged into an electrical wall socket and trap portion 420 is mounted in front of base portion 412. Light from one or more LEDs 414, in UV and/or visible light wavelengths, may transmit into cross-shaped cavity 454 in rear surface 428 of trap portion 420. In some embodiments, light is not manipulated in base portion 412 and is emitted directly into trap portion 414. A portion of the light may continue within the translucent or transparent walls of the trap portion 420, diffusing the light and spreading it evenly within trap portion 420 and through adhesive-coated inside surfaces 422. Another portion of the light may continue through rear wall 456 of trap portion 420 and into interior 430 of trap portion 420, where it illuminates adhesive-coated inside surfaces 422. A portion of the light entering trap portion 420 may continue through one or more openings 424 and is emitted into the surrounding area where the trap 410 is installed. Insects in the area are attracted to the UV and/or visible light transmitted through one or more openings 424, and fly or crawl into one or more openings 424 and onto adhesive coated inside surfaces 422, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through one or more openings 424. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion 420 without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion 314, and replace it with a new trap portion 420. The new trap portion 420 may have fresh adhesive-coated inside surfaces 422, a clean opening 426 in rear surface 428 through which the UV and/or visible light is transmitted into trap portion 420, and the transparent or translucent material of trap portion 420 has not been degraded by prolonged exposure to UV light, thereby ensuring that insect trap 410 will continue to efficiently and effectively attract and trap insects.

[0064] It should be appreciated that a benefit of trap 410 is the manipulation of light within trap portion 420. In some embodiments, light manipulation occurs solely within trap portion 420. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., trap portion 420 and adhesive-coated inside surfaces 422). In some embodiments, light manipulation produces an even distribution of light on an ad-

hesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion 420, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0065] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0066] An insect trap 410 of this configuration may accommodate a variety of different trap portions 420 that may be removably mounted to base portion 412, each trap portion 420 being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion 420, and the size, shape, and orientation of openings 424 in trap portion 420, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion 420 is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion 420 is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion 420 is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0067] In some embodiments, base portion 412 is approximately 10mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion 412 is 10mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion 412 is 10mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0068] As provided herein, openings 424 may be a variety of shapes and/or sizes. For example, openings 424 may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings 424 may be slots having straight, curved or undulating shapes or patterns. When openings 424 are circular, openings 424 may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings 424 are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings 424 are approximately 0.5mm to 15mm in diameter. When openings 424 are slot shaped, openings 424 may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings 424 are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings 320 are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0069] In some embodiments, openings **424** cover all or a portion of trap portion **420**. For example, openings **424** may cover a range of approximately 1% to 75% of the surface area of trap portion **420**. In some embodiments, openings **424** cover approximately 5% to 50% of the surface area of trap portion **420**. In some embodiments, openings **424** cover approximately 10% to 30% of the surface area of trap portion **420**.

[0070] Figure **12** is a front perspective view and Figure **13** is a rear perspective view of a fifth embodiment of an insect trap, indicated generally at **510**. Insect trap **510** includes a base portion **512** and a removable trap portion **514**. Base portion **512** includes a housing **516** with a large opening **518** in top surface **560** to receive trap portion **514**, one or more smaller openings **520** on front surface **562**, and two electrically conductive prongs **522** on rear surface **564**, adapted to mount insect trap **510** to a wall and provide power to insect trap **510** by inserting into a standard household electrical wall socket. While an electrical socket has been described as providing power to trap **510**, any suitable power source may be used. Base portion **512** may be injection molded of opaque plastic, although other materials and construction techniques could also be used.

[0071] Figure **14** is a front perspective view of insect trap **510** showing removable trap portion **514** partially removed from base portion **512**. Trap portion **514** may include a housing **524** with one or more openings **526** and a tab **528** adapted for removing and replacing trap portion **514**. Trap portion **514** may be removed by grasping tab **528** and lifting trap portion **514** out of housing **516** of base portion **512**. In some embodiments, openings **526** in trap portion **514** match or correspond to openings **520** in base portion **512** with respect to size, shape, orientation and location, so that they align when trap portion **514** is mounted into base portion **512**. In such embodiments, trap portion **514** may be viewed as an inner sleeve or pocket and base portion **512** may be viewed as an outer sleeve, where the inner sleeve can be dropped or inserted into the outer sleeve by a user.

[0072] Figure **15** is a perspective view, partly broken away, of trap portion **514**. Housing **524** includes inside surfaces **530** coated with translucent or transparent adhesive. As shown, housing **524** includes ribs **532** or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into the interior of trap portion **514**. In some embodiments, trap portion **514** is thermoformed of translucent or transparent sheet plastic, in two separate pieces, or in a 'clamshell' design, in which the two sides are joined at one side and folded together, although trap portion **514** could also be injection molded of translucent or transparent plastic or constructed of translucent paper or of other materials. In some embodiments, the material and thickness of trap portion **514** and the material and thickness of the adhesive are selected to transmit a substantial proportion of the UV and visible light, for

example greater than 60% of the light is transmitted through trap portion **514** and the adhesive coating. The materials of the trap portion **514** may also include insect attractants. For example, the materials of the trap portion **514** may be impregnated with, or coated with, sorbitol, coleopteran attractants including brevicomin, dominalure, frontaline, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlure, gossypilure, hexalure, litlure, looplure, orfuralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or any other substance that may provide a scent or other attractant that increases the insect-attracting efficiency of the insect trap. In such embodiments, the insect attractant is integral to trap portion **514**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on an inside surface **530** of housing **524** or through an opening **526** in housing **524**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **510**.

[0073] Figure **16** is a cross-sectional view through insect trap **510** showing the interiors of base portion **512** and trap portion **514**. In some embodiments, base portion **512** includes a circuit board **534** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **522**, only one of which is shown, and a lighting element such as one or more LEDs **536**, one that emits ultraviolet (UV) light and/or one that emits visible light (e.g., blue light). For clarity, not all of the electrical connections are shown. The circuit board **534** may include electronic circuitry to receive any household current from conductive prongs **522** and provide power to illuminate the one or more LEDs **536**. Alternatively, circuit board **534** may be configured to receive power from batteries (not shown) mounted in base portion **512**. While an electrical socket and batteries have been described as providing power to trap **510**, any suitable power source may be used. Circuit board **534** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit to provide steady voltage to the one or more LEDs **536**, although it could also provide a varying voltage to the one or more LEDs **536** to provide a flickering light, which some species of insect find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 270Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **534** may provide power to one or more LEDs **536** to provide both UV and visible light, although it could be configured to provide power to only one or more UV LEDs **536** or to only one or more visible light LEDs **536**, or to

provide variable power to produce combinations of flickering UV and visible light. Circuit board **534** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **512** to emit an insect-attracting sound. For example, the transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by an insect for approximately a 2 meter radius from trap portion **510**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **510**.

[0074] In the operation of insect trap **510**, conductive prongs **522** are inserted into a wall electrical socket. One or more LEDs **536** emit light, represented by arrows, preferably UV and visible light, which transmit through rear surface **538** of housing **524** of trap portion **514**. In some embodiments, light is not manipulated in base portion **512** and is emitted directly into trap portion **514**. A portion of the light continues within the enclosure, up one or more sides **572** of housing **524**, and out through adhesive-coated inside surfaces **530**. Another portion of the light may continue through the wall of housing **524** and into the enclosure, where it illuminates the adhesive-coated inside surfaces **530**. A portion of the light entering the enclosure may continue through openings **526** in trap portion **514** and corresponding openings **520** in base portion and be emitted into the area where the insect trap **510** is installed. Insects in the area are attracted to the UV and/or visible light transmitted through openings **520** in base portion **512**, and fly or crawl into openings **520** and onto the adhesive-coated inside surfaces **530** of trap portion **514**, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through openings **520** and **526**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **514** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **514**, and replace it with a new trap portion **514**. The new trap portion **514** may include fresh adhesive coating its inside surfaces **530**, housing **524** has a clean rear surface **538**, through which the UV and visible light is transmitted into trap portion **514**, and the transparent or translucent material of trap portion **514** has not been degraded by prolonged exposure to UV light, thereby ensuring that insect trap **510** will continue to efficiently and effectively attract and trap insects.

[0075] It should be appreciated that a benefit of trap **510** is the manipulation of light within trap portion **514**. In some embodiments, light manipulation occurs solely within trap portion **514**. Light manipulation may include

reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., housing **516** and adhesive-coated inside surfaces **530**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **514**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0076] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0077] An insect trap **510** of this configuration may accommodate a variety of different trap portions **514** that may be removably mounted to base portion **512**, each trap portion **514** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **514**, and the size, shape, and orientation of openings **526** in housing **524** of trap portion **514**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **514** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **514** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **514** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0078] In some embodiments, base portion **512** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **512** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **512** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0079] As provided herein, openings **526** and openings **520** may be a variety of shapes and/or sizes. For example, openings **526** and openings **520** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **526** and openings **520** may be slots having straight, curved or undulating shapes or patterns. When openings **526** and openings **520** are circular, openings **526** and openings **520** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **526** and circular openings **520** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **526** and circular openings

520 are approximately 0.5mm to 15mm in diameter. When openings **526** and openings **520** are slot shaped, openings **526** and openings **526** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **526** and slot openings **520** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **526** and slot openings **520** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0080] In some embodiments, openings **526** cover all or a portion of trap portion **514**. For example, openings **526** may cover a range of approximately 1% to 75% of the surface area of trap portion **514**. In some embodiments, openings **526** cover approximately 5% to 50% of the surface area of trap portion **514**. In some embodiments, openings **526** cover approximately 10% to 30% of the surface area of trap portion **514**.

[0081] Figure 17 shows an exploded view of a sixth embodiment of an insect trap, indicated generally at **610**. Insect trap **610** includes a base portion **612** and a removable trap portion **614**. Trap portion **614** is shown removed from base portion **612** in this view. In some embodiments, base portion **612** includes a switch **616**, configurable to enable insect trap **610** to be turned on or off by closing or opening switch **616**, as desired by the user. Alternatively, switch **616** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Trap portion **614** includes a front housing **618** with at least one opening **620**.

[0082] Protruding from a rear surface **670** (shown in Figure 18) of base portion **612** are two electrically conductive prongs **622**, only one of which is shown, adapted to mount insect trap **610** to a wall and provide power to insect trap **610** by inserting prongs **622** into a standard household electrical wall socket. Alternatively, base portion **612** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **612**. While an electrical socket and batteries have been described as providing power to trap **610**, any suitable power source may be used. Base portion **612** includes a lighting element such as one or more LEDs **624** and a rear housing **626** which includes a reflective-coated inside surface **628**. In some embodiments, the LEDs include one that emits ultraviolet (UV) light and one that emits visible light (e.g., blue light). In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, the material and surface finish of rear housing **626** may be configured to reflect UV and/or visible light without a reflective coating. As shown, base portion **612** includes a transparent or translucent window **630**, shown partially cut away to reveal the LEDs **624**. Transparent or translucent window **630** protects the reflective-coated inside surface **628** of rear housing **626** and one or more LEDs **624** from dust and insect debris and allows base

portion **612** to be easily cleaned. Transparent or translucent window **630** may be attached at its perimeter (not shown) to rear housing **626** by any suitable manufacturing technique such as gluing or ultrasonic welding. In some embodiments, transparent or translucent window **630** is removably attached to rear housing **626**. Base portion **612** includes one or more openings **632**. In some embodiments, on perimeter **672** of top surface **634** of base **612** is an upwardly directed rim or protrusions **636**.

[0083] Figure 18 shows a cross-sectional view of the of insect trap **610**, with removable trap portion **614** mounted on base portion **612**, and showing the interiors of base portion **612** and removable trap portion **614**. Removable trap portion **614** includes front housing **618** with the at least one opening **620** and a back plate **638**, which may be constructed of transparent or translucent material and coated with a transparent or translucent adhesive **640** on a front surface **642**. In some embodiments, the material and thickness of back plate **638** and the material and thickness of the adhesive **640** are selected to transmit a substantial proportion of the UV and / or visible light, for example greater than 60% of the light is transmitted through back plate **638** and adhesive **640**. Front housing **618** of trap portion **614** and rear housing **626** of base portion **612** may be constructed from any suitable material, including a thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, front housing **618** and rear housing **626** are constructed by injection molding or by other suitable manufacturing techniques. Back plate **638** may be substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, back plate **638** may have ribs or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into trap portion **614**.

[0084] In some embodiments, front housing **618** is be coated with transparent, translucent or opaque adhesive on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **618** may also have a reflective coating underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **618** and back plate **638** may be joined together at their perimeters with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **614** may include an insect attractant. For example, the materials of trap portion **614** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominalure, frontaline, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including cer-

alure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of the insect trap. In such embodiments, the insect attractant is integral to trap portion **614**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on an inside surface of front housing **618** or through an opening **620** in front housing **618** or on front surface **642** of back plate **638**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **610**.

[0085] As shown, front housing **618** and back plate **638** form a front enclosure **644** in trap portion **614**, and rear housing **626** and window **630** form a rear enclosure **646** in base portion **612**. In some embodiments, base portion **612** includes a circuit board **648** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **622**, switch **616** and one or more LEDs **624**. For clarity, however, not all of the electrical connections are shown. Circuit board **648** may include electronic circuitry to receive ordinary household current from conductive prongs **622**, respond to the position of switch **616** and provide power to illuminate one or more LEDs **624**. Circuit board **648** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to one or more LEDs **624** when switch **616** is in a closed position, although it may also provide a varying voltage to one or more LEDs **624** to provide a flickering light, which some species of insects find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **648** may provide power to one or more LEDs **624** to provide both UV and visible light, although it may be configured to provide power to only one or more UV LEDs **624** or to only one or more visible light LEDs **624**, or to provide variable power to produce combinations of flickering UV and visible light. Circuit board **648** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in the base portion **612** to emit an insect-attracting sound. For example, the transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by

an insect for approximately a 2 meter radius from trap **610**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **610**.

[0086] As shown, upward protrusions or rim **636** on top surface **634** of base portion **612** engage with trap portion **614** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **614** to be securely but removably mounted to base portion **612**.

[0087] In the operation of insect trap **610**, conductive prongs **622** are inserted into a wall electrical socket, and switch **616** is moved to a closed position. One or more LEDs **624** emit light, preferably UV and visible light, represented by arrows, which transmit through at least one opening **632** in base portion **612**, into rear enclosure **646**, and onto reflective-coated inside surface **628** of rear housing **626** and rear surface **650** of window **630**. In some embodiments, light is not manipulated in base portion **612** and is emitted directly into trap portion **614**. Reflective-coated inside surface **628** of rear housing **626** may include a concave shape and may be configured to reflect the UV and visible light from one or more LEDs **624** to distribute the light evenly onto rear surface **650** of window **630**, although inside surface **628** of rear housing **626** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute UV and/or visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **650** of window **630**, may be mounted to base portion **612** at or near opening **632** in base portion **612**, and may replace or augment the role of reflective-coated inside surface **628** of rear housing **626**. Alternatively, the UV and/or visible light from one or more LEDs **624** may directly strike rear surface **650** of window **630** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across and through window **630** of base portion **612** and onto back plate **638** of trap portion **614**, and may replace or augment the role of reflective-coated inside surface **628** of rear housing **626** or of the lens or lenses mounted to base portion **612**. The light may transmit through back plate **638** and adhesive coating **640** on front surface **642**, and into front enclosure **644**. The light may be further evenly distributed by light-diffusing properties of window **630** of base portion **612**, back plate **638** of trap portion **614**, adhesive coating **640** on front surface **642** of back plate **638**, or any combination of window **630**, back plate **638** and adhesive coating **640**. In some embodiments, a portion of the light entering front enclosure **644** continues through one or more openings **620** in front housing **618** and is emitted into the area where the trap is installed. Insects may be attracted to the UV and/or visible light transmitted through adhesive coating **640** and/or through one or more openings **620** in front housing **618**, and fly or crawl into one or more openings **620** and

onto adhesive coating **640**, where they become trapped in the adhesive. The user may observe trapped insects by looking through one or more openings **620** in front housing **618**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **614** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **614**, and replace it with a new trap portion **614**. The new trap portion **614** may have fresh adhesive-coated surfaces, ensuring that insect trap **610** will continue to efficiently and effectively attract and trap insects.

[0088] It should be appreciated that a benefit of trap **610** is the manipulation of light within trap portion **614**. In some embodiments, light manipulation occurs solely within trap portion **614**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **628**, window **630**, back plate **638** and adhesive coating **640**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating **640**. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating **640** or within trap portion **614**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0089] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0090] An insect trap **610** of this configuration may accommodate a variety of different trap portions **614** that may be removably mounted to base portion **612**, each trap portion **614** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **614**, and the size, shape, and orientation of openings **620** in front housing **618** of trap portion **614**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **614** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **614** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **614** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0091] In some embodiments, base portion **612** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base

portion **612** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **612** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0092] As provided herein, openings **620** may be a variety of shapes and/or sizes. For example, openings **620** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **620** may be slots having straight, curved or undulating shapes or patterns. When openings **620** are circular, openings **620** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **620** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **620** are approximately 0.5mm to 15mm in diameter. When openings **620** are slot shaped, openings **620** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **620** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **120** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0093] In some embodiments, openings **620** cover all or a portion of trap portion **614**. For example, openings **620** may cover a range of approximately 1% to 75% of the surface area of trap portion **614**. In some embodiments, openings **620** cover approximately 5% to 50% of the surface area of trap portion **614**. In some embodiments, openings **620** cover approximately 10% to 30% of the surface area of trap portion **614**.

[0094] Figure **19** shows a cross-sectional view of a seventh embodiment of an insect trap, indicated generally at **710**, and Figure **20** is an enlarged view of a portion of Figure **19**. Insect trap **710** includes a base portion **712** and a removable trap portion **714**. As shown, base portion **712** includes a switch **716**, configurable to enable insect trap **710** to be turned on or off by closing or opening switch **716**, as desired by the user. Alternatively, switch **716** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Protruding from a rear surface **770** of base portion **712** are two electrically conductive prongs **718** (only one of which is shown in this view) adapted to mount insect trap **710** to a wall and provide power to insect trap **710** by inserting prongs **718** into a standard household electrical wall socket. Alternatively, base portion **712** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **712**. While an electrical socket and batteries have been described as providing power to trap **710**, any suitable power source may be used. In some embodiments, a slot **722** is located in a top surface **720** of base portion **712**, and upwardly directed protrusions **724** are located on a perimeter of top surface **720**.

[0095] Trap portion **714** includes a front housing **726** with at least one opening **728**, a divider **730**, a rear hous-

ing **736**, a lighting element such as one or more LEDs **740**, and electrical trap contacts **742**. In some embodiments, divider **730** is constructed from transparent or translucent material and is coated with a transparent or translucent adhesive **732** on a front surface **734**. In some embodiments, the material and thickness of the divider **730** and the material and thickness of the adhesive **732** are selected to transmit a substantial proportion of the UV and/or visible light, for example greater than 60% of the light is transmitted through divider **730** and adhesive **732**. In some embodiments, LEDs **740** include one that emits ultraviolet (UV) light and one that emits visible light (e.g., blue light). In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. As shown, there are two electrical trap contacts **742** for each of the one or more LEDs **740**. Thus, each pair of trap contacts **742** are electrically connected to their respective LED **740**.

[0096] In some embodiments, rear housing **736** includes a reflective-coated inside surface **738**. The material and surface finish of rear housing **736** may alternatively be configured to reflect UV and/or visible light without a reflective coating. Front housing **726** and rear housing **736** may be constructed from any suitable material, including a thermoformed opaque plastic material or other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, front housing **726** and rear housing **736** are constructed by injection molding or by other suitable manufacturing techniques.

[0097] As shown, divider **730** may be substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, divider **730** may include ribs or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into interior of trap portion **714**. In some embodiments, front housing **726** is coated with transparent, translucent or opaque adhesive on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **726** may include a reflective coating underneath the adhesive coating on an inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **726**, divider **730** and rear housing **736** may be joined together at their perimeters with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method.

[0098] The materials of trap portion **714** may also include insect attractants. For example, trap portion **714** may be impregnated with be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalinal, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including cer-

alure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlure, gossypylure, hexalure, litlure, looplure, orfuralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of the insect trap. In such embodiments, the insect attractant is integral to trap portion **714**. Alternatively, the insect attractants may be embedded in a separate piece that mounts on an inside surface of front housing **726** or through an opening **728** in front housing **726** or on front surface **734** of divider **730**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from trap **710**. As shown, divider **730** separates trap portion **714** into a front enclosure **744** and a rear enclosure **746**.

[0099] In some embodiments, base portion **712** includes a circuit board **748** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **718**, switch **716**, and electrical base contacts **750**. For clarity, however, not all of the electrical connections are shown. While two base contacts **750** in the base portion **712** for each of the LEDs **740** in the trap portion **714** are shown, any suitable number may be used. Base contacts **750** may be configured to provide an electrical connection with trap contacts **742** when trap portion **714** is removably mounted to base portion **712**. Circuit board **748** may include electronic circuitry to receive ordinary household current from conductive prongs **718**, respond to the position of switch **716** and provide power to base contacts **750**, which, in turn, provide power to trap contacts **742** and illuminate LEDs **740** in trap portion **714** when trap portion **714** is mounted to base portion **712**. In some embodiments, circuit board **748** includes an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to one or more LEDs **740** when switch **716** is in a closed position and trap portion **714** is mounted to base portion **712**, although it may also provide a varying voltage to one or more LEDs **740** to provide a flickering light, which some species of insects find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **748** may provide power to one or more LEDs **740** to provide both UV and visible light, although it may be configured to provide power to only one or more UV LEDs **740** or to only one or more visible light LEDs **740**, or to provide variable power to produce combinations of flickering UV and visible light. Circuit board **748** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **712** to emit an insect-attracting sound. For example, the

transmitter or transceiver may emit an insect-attracting sound having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240KHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100KHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50KHz. It is desirable for such insect-attracting sound to be detectable by an insect for approximately a 2 meter radius from trap **710**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter radius from trap **710**.

[0100] In some embodiments, base portion **712** includes a slot **722** and protrusions **724** in top surface **720**, which are configured to engage with trap portion **714** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **714** to be securely but removably mounted to base portion **712**.

[0101] In the operation of insect trap **710**, conductive prongs **718** are inserted into a wall electrical socket, switch **716** is moved to a closed position, and trap portion **714** is mounted to base portion **712**. One or more LEDs **740** emit light, represented by arrows, preferably UV and visible light, which transmit light into rear enclosure **746**, and onto reflective-coated inside surface **738** of rear housing **736** and rear surface **752** of divider **730**. In some embodiments, light is not manipulated in base portion **712** and is emitted directly into trap portion **714**. Reflective-coated inside surface **738** of rear housing **736** may be a concave shape and configured to reflect UV and/or visible light from one or more LEDs **740** to distribute the light evenly onto rear surface **752** of divider **730**, although the shape of inside surface **738** of rear housing **736** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs (not shown) or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute UV and/or visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **752** of divider **730**, may be mounted to rear housing **736** proximate to or above LEDs **740** or may be mounted to LEDs **740**, and may replace or augment the role of reflective-coated inside surface **738** of rear housing **736**. Alternatively, the UV and/or visible light from one or more LEDs **740** may directly strike the rear surface **752** of divider **730** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider **730**, and may replace or augment the role of reflective-coated inside surface **738** of rear housing **736**, or of the lens or lenses mounted to rear housing **736** or to LEDs **740**. The light may transmit through divider **730** and adhesive coating **732** on front surface **734**, and into front enclosure **744**. The light may be further evenly distributed by the light-diffusing properties of divider **730**, adhesive coating **732** on front surface **734**, or both. A portion of the light entering front

enclosure **744** continues through one or more openings **728** in front housing **726** and is emitted into the area where trap **710** is installed. Insects may be attracted to the UV and/or visible light transmitted through adhesive coating **732** and/or through one or more openings **728** in front housing **726**, and fly or crawl into one or more openings **728** and onto adhesive coating **732**, where they become trapped in the adhesive. The user may observe trapped insects by looking through one or more openings **728** in front housing **726**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **714** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **714**, and replace it with a new trap portion **714**. The new trap portion **714** may have fresh adhesive-coated surfaces and light-directing surfaces, ensuring that the insect trap **710** will continue to efficiently and effectively attract and trap insects.

[0102] It should be appreciated that a benefit of trap **710** is the manipulation of light within trap portion **714**. In some embodiments, light manipulation occurs solely within trap portion **714**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **738**, divider **730** and adhesive coating **732**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **714**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[0103] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[0104] An insect trap **710** of this configuration may accommodate a variety of different trap portions **714** that may be removably mounted to base portion **712**, each trap portion **714** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **714**, the size, shape, and orientation of openings **728** in front housing **726** of trap portion **714**, and the wavelength and intensity of the LEDs **740** may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **714** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embod-

iments, trap portion **714** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **714** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[0105] In some embodiments, base portion **712** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **712** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **712** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[0106] As provided herein, openings **728** may be a variety of shapes and/or sizes. For example, openings **728** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, openings **728** may be slots having straight, curved or undulating shapes or patterns. When openings **728** are circular, openings **728** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular openings **728** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular openings **728** are approximately 0.5mm to 15mm in diameter. When openings **728** are slot shaped, openings **728** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot openings **728** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot openings **728** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[0107] In some embodiments, openings **728** cover all or a portion of trap portion **714**. For example, openings **728** may cover a range of approximately 1% to 75% of the surface area of trap portion **714**. In some embodiments, openings **728** cover approximately 5% to 50% of the surface area of trap portion **714**. In some embodiments, openings **728** cover approximately 10% to 30% of the surface area of trap portion **714**.

[0108] Figure **21** is a perspective view of an insect trap in accordance with the invention, indicated generally at **810**. Insect trap **810** includes a trap portion **814** and a base portion **812**. In Figure **21**, trap portion **814** is shown removed from the base portion **812**. In some embodiments, trap portion **814** includes a tab **818** protruding downward from a bottom surface **850**. Base portion **812** may have a corresponding opening **824** (shown in Figure **23**) to receive tab **818** when trap portion **814** is mounted to base portion **812**. As shown, base portion **812** includes a switch **816**.

[0109] Figure **22** is a cross sectional view of insect trap **810** showing trap portion **814** mounted to base portion **812** and Figure **23** is an enlarged view of a portion of Figure **22**. In some embodiments, base portion **812** includes a circuit board **822** having a programmable processor or chip (not shown) for executing commands, and configured to provide power and instructions to desired components (e.g., switch **816**, LEDs **826**, etc.). For clarity, however, not all of the electrical connections are shown. In some embodiments, circuit board **822** includes

a docking or trap switch **820** mounted thereon. Tab **818** on trap portion **814** may protrude through corresponding opening **824** in base portion **812** and engage electrical trap switch **820** when trap portion **814** is mounted to base portion **812**. Trap switch **820** may be configured to close when tab **818** on trap portion **814** engages with it and may be configured to open when the **818** is lifted from trap switch **820** (e.g., when trap portion **814** is removed from base portion **812**). In some embodiments, trap switch **820** is configured to activate in response to pressure from tab **818** on trap portion **814**. Alternatively, trap switch **820** may be configured to activate in response to displacement by tab **818** on trap portion **814**. Alternatively, trap switch **820** may be configured as an optical switch to close when a light beam is broken by tab **818** of trap portion **814**, or may be configured as a Hall effect sensor to close when in proximity to a magnet on trap portion **814**, or may be configured as any other switch or sensor that opens or closes when trap portion **814** is mounted or removed from base portion **812**.

[0110] Trap switch **820** is electrically connected to circuit board **822** and/or switch **816** to deactivate a lighting element such as UV and/or visible light LEDs **826** when trap portion **814** is removed from base portion **812**, thereby preventing the user from looking directly at the UV and/or visible light from the LEDs **826**. Alternatively, trap switch **820** may be electrically connected to circuit board **822** and/or switch **816** to deactivate only the UV LEDs **826** when trap portion **814** is removed from the portion **812**.

[0111] In view of the many possible embodiments to which the principles of the present discussion may be applied, it should be recognized that the embodiments described herein with respect to the drawing figures are meant to be illustrative only and should not be taken as limiting the scope of the claims. For example, while angle measurements have been described as relative to the primary direction of light from the LEDs, for simplicity, the angles could also be relative to the vertical axis. In addition, for each of the embodiments, the front of the housing (or the entire housing or the entire trap portion) may be formed in a variety of decorative and/or functional shapes. For example, the housing may be shaped to resemble a flower or a plant, or a shell, or a company logo, or a sports team logo, or a football, or basketball, or soccer ball, or hockey puck, or a football helmet, or a hockey stick, or any other shape. Each of the example embodiments may include elements from other embodiments, even if not explicitly shown. Therefore, the techniques as described herein contemplate all such embodiments as may come within the scope of the following claims and equivalents thereof.

Claims

1. An insect trap (810), comprising;

a trap portion (814) and a base portion (812), the base portion (812) comprising a lighting element (826), a mounting portion,

wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source;

the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the trap portion (814) comprises an enclosure comprising an adhesive (136) surface and a first opening (120) through which an insect may enter the enclosure, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect;

characterized in that

the base portion comprises a switch (820); and the trap portion comprises a downwardly protruding tab (818) that displaces the switch (820) of the base portion (812) to close the switch (820) when the insect trap portion (814) is mounted on the base portion (812).

2. An insect trap according to any of the preceding claims, comprises rigid conductors protruding substantially perpendicularly and directly from a rear surface of the insect trap (810), wherein the conductors are insertable into an electrical socket.
3. An insect trap according to claim 1, wherein the insect trap portion further comprises a bottom surface (850) from which the tab (818) protrudes.
4. An insect trap according to any of the preceding claims, wherein the tab (818) protrudes through an opening (824) in the base portion (812) when the insect trap portion (814) is mounted to the base portion (812).
5. An insect trap according to any of the preceding claims, wherein the switch (820) activates when the tab (818) of the insect trap portion (814) displaces the switch (820).
6. An insect trap according to any of the preceding claims, wherein the switch (820) deactivates the lighting element (826) when the trap portion (814) is removed from the base portion (812).
7. An insect trap according to any of the preceding claims, wherein the base portion comprises a circuit board comprising a programmable processor or chip configured to execute commands, and provide power and instructions to components.

8. A method of using an insect trap (810) according to any of claims 1 to 7, comprising: mounting the trap portion (814) on the base portion (812), coupling the base portion to a power source for providing power to a lighting element, wherein the tab (818) displaces the switch (820) to activate the switch (820).
9. The method of claim 8 wherein the base portion (812) comprises rigid conductors protruding substantially perpendicularly and directly from a rear surface of the insect trap, wherein the conductors are insertable into an electrical socket.
10. A method according to claims 9, further comprising inserting the electrically conductive prongs into an electric socket.
11. A method according to claims 8 to 9, wherein an insect is received into the trap portion (814) through the opening and adheres to the adhesive surface.
12. A method according to claim 11, further comprising separating the trap portion (814) from the base portion (812) and disposing of the trap portion (814).
13. A method according to claim 12, wherein the insect remains disposed within the trap portion (814).
14. A method according to claim 12 or 13, wherein the trap portion (814) is disposed without human contact with the insect adhered to the adhesive surface.
15. A method according to claims 10 to 12, wherein upon separating the trap portion from the base portion, the lighting element is powered off.

Patentansprüche

1. *Insektenfalle (810), umfassend; einen Fallenabschnitt (814) und einen Basisabschnitt (812), wobei der Basisabschnitt (812) ein Leuchtelement (826), einen Montageabschnitt umfasst, wobei das Leuchtelement dafür konzipiert ist, Licht für den Fallenabschnitt bereitzustellen, und wobei der Montageabschnitt dafür konzipiert ist, mit einer Stromquelle zu kommunizieren und Strom von dieser zu empfangen; wobei der Fallenabschnitt derart konzipiert ist, dass er entferntbar mit dem Basisabschnitt in Eingriff gelangt und Licht von dem Basisabschnitt empfängt, wenn er damit in Eingriff steht, und wobei der Fallenabschnitt (814) eine Hülle umfasst, die eine Oberfläche eines Haftmittels (136) und eine erste Öffnung (120) umfasst, durch die ein Insekt in die Hülle eindringen kann, wobei die Haftmitteloberfläche we-*

nigstens teilweise innerhalb der Hülle enthalten und dafür konzipiert ist, an einem Insekt anzuhaften;

dadurch gekennzeichnet, dass

der Basisabschnitt einen Schalter (820) umfasst; und

der Fallenabschnitt einen nach unten vorstehenden Streifen (818) umfasst, der den Schalter (820) des Basisabschnitts (812) verschiebt, um den Schalter (820) zu schließen, wenn der Insektenfallenabschnitt (814) an dem Basisabschnitt (812) angebracht ist.

2. Insektenfalle nach einem der vorstehenden Ansprüche, die steife Leiter umfasst, die im Wesentlichen senkrecht und direkt von einer hinteren Oberfläche der Insektenfalle (810) vorstehen, wobei die Leiter in eine elektrische Buchse einsetzbar sind. 15
3. Insektenfalle nach Anspruch 1, wobei der Insektenfallenabschnitt ferner eine Unterseite (850) umfasst, von der der Streifen (818) hervorstet. 20
4. Insektenfalle nach einem der vorstehenden Ansprüche, wobei der Streifen (818) durch eine Öffnung (824) in dem Basisabschnitt (812) vorsteht, wenn der Insektenfallenabschnitt (814) an dem Basisabschnitt (812) angebracht ist. 25
5. Insektenfalle nach einem der vorstehenden Ansprüche, wobei der Schalter (820) aktiviert wird, wenn der Streifen (818) des Insektenfallenabschnitts (814) den Schalter (820) verschiebt. 30
6. Insektenfalle nach einem der vorstehenden Ansprüche, wobei der Schalter (820) das Leuchtelement (826) deaktiviert, wenn der Fallenabschnitt (814) von dem Basisabschnitt (812) entfernt wird. 35
7. Insektenfalle nach einem der vorstehenden Ansprüche, wobei der Basisabschnitt eine Leiterplatte umfasst, die einen programmierbaren Prozessor oder Chip umfasst, der dazu konzipiert ist, Befehle auszuführen und Strom und Anweisungen an Komponenten bereitzustellen. 40
8. Verfahren zum Verwenden einer Insektenfalle (810) nach einem der Ansprüche 1 bis 7, umfassend: Anbringen des Fallenabschnitts (814) an dem Basisabschnitt (812), Kuppeln des Basisabschnitts mit einer Stromquelle zum Bereitstellen von Strom für ein Leuchtelement, wobei der Streifen (818) den Schalter (820) verschiebt, um den Schalter (820) zu aktivieren. 45
9. Verfahren nach Anspruch 8, wobei der Basisabschnitt (812) steife Leiter umfasst, die im Wesentlichen senkrecht und direkt von einer hinteren Oberfläche der Insektenfalle hervorstehen, wobei die Lei- 50

ter in eine Steckdose einführbar sind.

10. Verfahren nach Anspruch 9, ferner das Einführen der elektrisch leitfähigen Zinken in eine Steckdose umfassend. 5
11. Verfahren nach den Ansprüchen 8 bis 9, wobei ein Insekt durch die Öffnung in den Fallenabschnitt (814) aufgenommen wird und an der Haftmitteloberfläche anhaftet. 10
12. Verfahren nach Anspruch 11, ferner das Trennen des Fallenabschnitts (814) von dem Basisabschnitt (812) und das Entsorgen des Fallenabschnitts (814) umfassend. 15
13. Verfahren nach Anspruch 12, wobei das Insekt innerhalb des Fallenabschnitts (814) angeordnet bleibt. 20
14. Verfahren nach Anspruch 12 oder 13, wobei der Fallenabschnitt (814) ohne menschlichen Kontakt mit dem an der Haftmitteloberfläche haftenden Insekt entsorgt wird. 25
15. Verfahren nach den Ansprüchen 10 bis 12, wobei nach dem Trennen des Fallenabschnitts von dem Basisabschnitt das Leuchtelement abgeschaltet wird. 30

Revendications

1. Piège à insectes (810), comprenant ;
une partie de piège (814) et une partie de base (812),
la partie de base (812) comprenant un élément d'éclairage (826), une partie de montage, dans lequel l'élément d'éclairage est configuré pour fournir de la lumière à la partie de piège, et dans lequel la partie de montage est configurée pour communiquer avec une source d'alimentation et recevoir de l'énergie de celle-ci ;
la partie de piège est configurée pour venir en prise de façon amovible avec la partie de base et recevoir de la lumière de la partie de base lorsqu'elle est en prise avec celle-ci, et dans lequel la partie de piège (814) comprend une enceinte comprenant une surface adhésive (136) et une première ouverture (120) à travers laquelle un insecte peut entrer dans l'enceinte, dans lequel la surface adhésive est au moins partiellement contenue au sein de l'enceinte et est configurée pour adhérer à un insecte ;
caractérisé en ce que
la partie de base comprend un commutateur (820) ;
et
la partie de piège comprend une languette faisant saillie vers le bas (818) qui déplace le commutateur (820) de la partie de base (812) pour fermer le com- 45

- mutateur (820) lorsque la partie de piège à insectes (814) est montée sur la partie de base (812).
2. Piège à insectes selon l'une quelconque des revendications précédentes, comprenant des conducteurs rigides faisant saillie de manière essentiellement perpendiculaire et directement à partir d'une surface arrière du piège à insectes (810), dans lequel les conducteurs peuvent être insérés dans une prise électrique. 5
 3. Piège à insectes selon la revendication 1, dans lequel la partie de piège à insectes comprend en outre une surface inférieure (850) à partir de laquelle la languette (818) fait saillie. 10
 4. Piège à insectes selon l'une quelconque des revendications précédentes, dans lequel la languette (818) fait saillie à travers une ouverture (824) dans la partie de base (812) lorsque la partie de piège à insectes (814) est montée sur la partie de base (812). 15
 5. Piège à insectes selon l'une quelconque des revendications précédentes, dans lequel le commutateur (820) s'active lorsque la languette (818) de la partie de piège à insectes (814) déplace le commutateur (820). 20
 6. Piège à insectes selon l'une quelconque des revendications précédentes, dans lequel le commutateur (820) désactive l'élément d'éclairage (826) lorsque la partie de piège (814) est retirée de la partie de base (812). 25
 7. Piège à insectes selon l'une quelconque des revendications précédentes, dans lequel la partie de base comprend une carte de circuit comprenant un processeur ou une puce programmable, configuré pour exécuter des commandes et fournir de l'énergie et des instructions aux composants. 30
 8. Procédé d'utilisation d'un piège à insectes (810) selon l'une quelconque des revendications 1 à 7, comprenant : 35
le montage de la partie de piège (814) sur la partie de base (812), le couplage de la partie de base à une source d'alimentation pour alimenter en énergie un élément d'éclairage, dans lequel la languette (818) déplace le commutateur (820) pour activer le commutateur (820). 40
 9. Procédé selon la revendication 8, dans lequel la partie de base (812) comprend des conducteurs rigides faisant saillie de manière essentiellement perpendiculaire et directement à partir d'une surface arrière du piège à insectes, dans lequel les conducteurs peuvent être insérés dans une prise électrique. 45
 10. Procédé selon les revendications 9, comprenant en outre l'insertion de plots électriquement conducteurs dans une prise électrique. 50
 11. Procédé selon les revendications 8 à 9, dans lequel un insecte est reçu dans la partie de piège (814) à travers l'ouverture et adhère à la surface adhésive. 55
 12. Procédé selon la revendication 11, comprenant en outre la séparation de la partie de piège (814) par rapport à la partie de base (812) et la mise au rebut de la partie de piège (814).
 13. Procédé selon la revendication 12, dans lequel l'insecte reste en place au sein de la partie de piège (814).
 14. Procédé selon la revendication 12 ou 13, dans lequel la partie de piège (814) est mise au rebut sans contact humain avec l'insecte fixé par adhérence sur la surface adhésive.
 15. Procédé selon les revendications 10 à 12, dans lequel, lors de la séparation de la partie de piège par rapport à la partie de base, l'élément d'éclairage est mis hors tension.

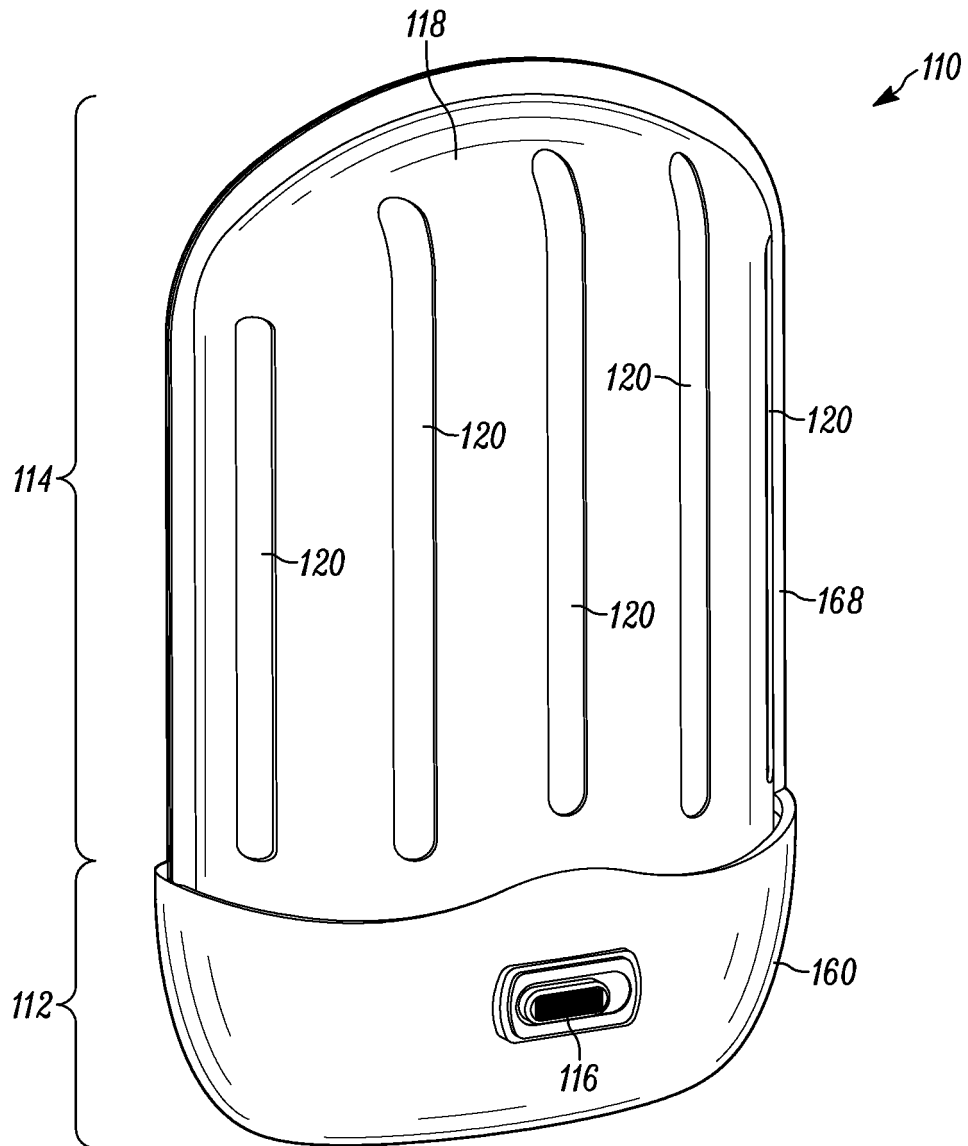


Fig. 1

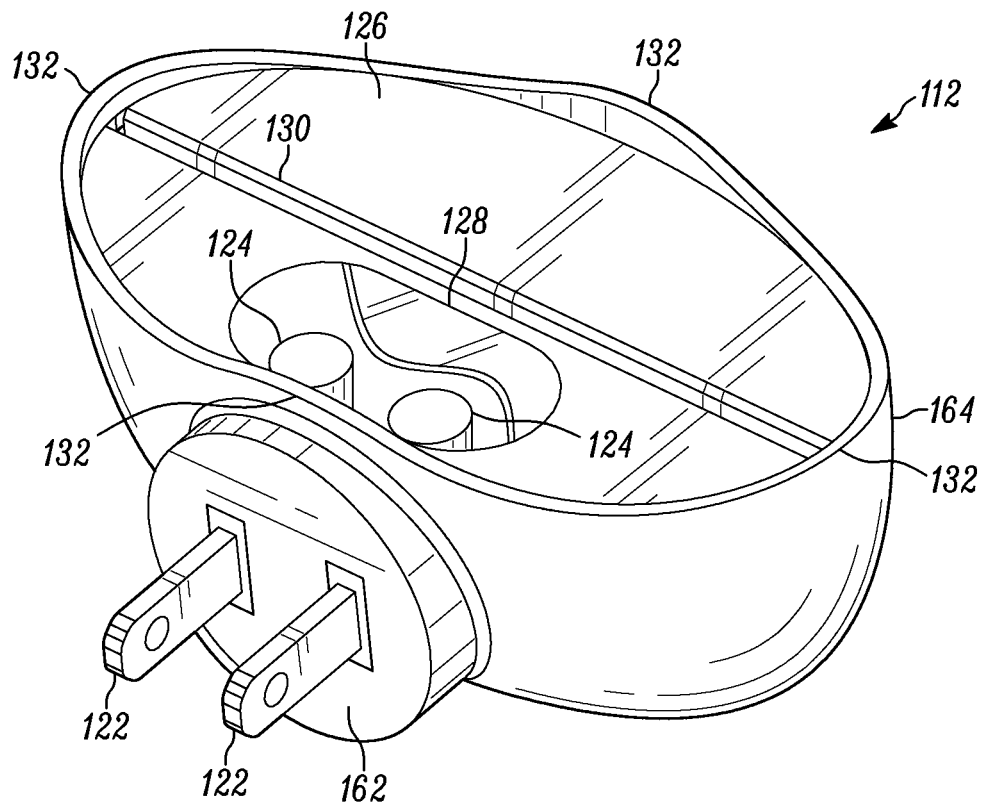


Fig. 2

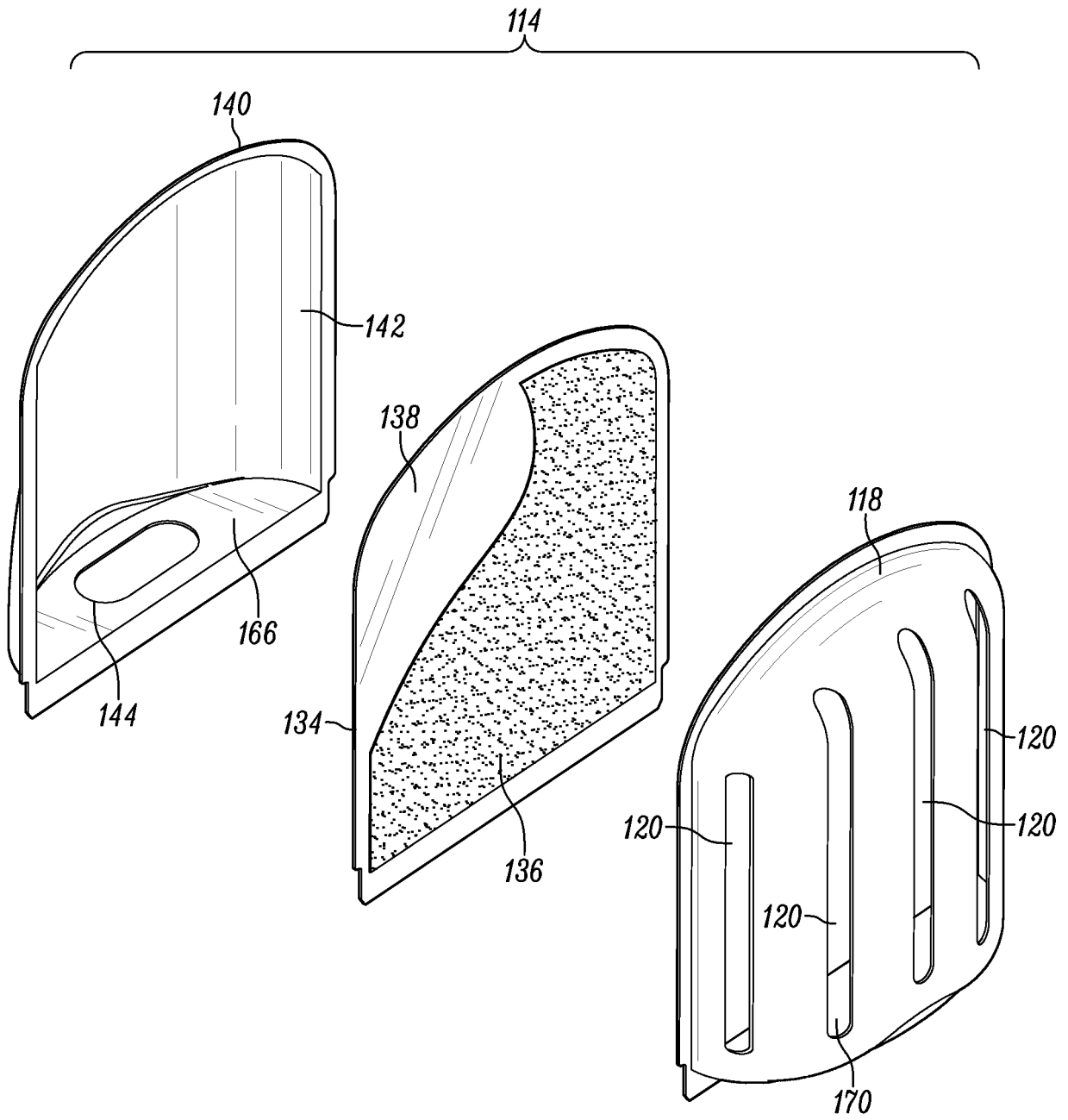


Fig. 3

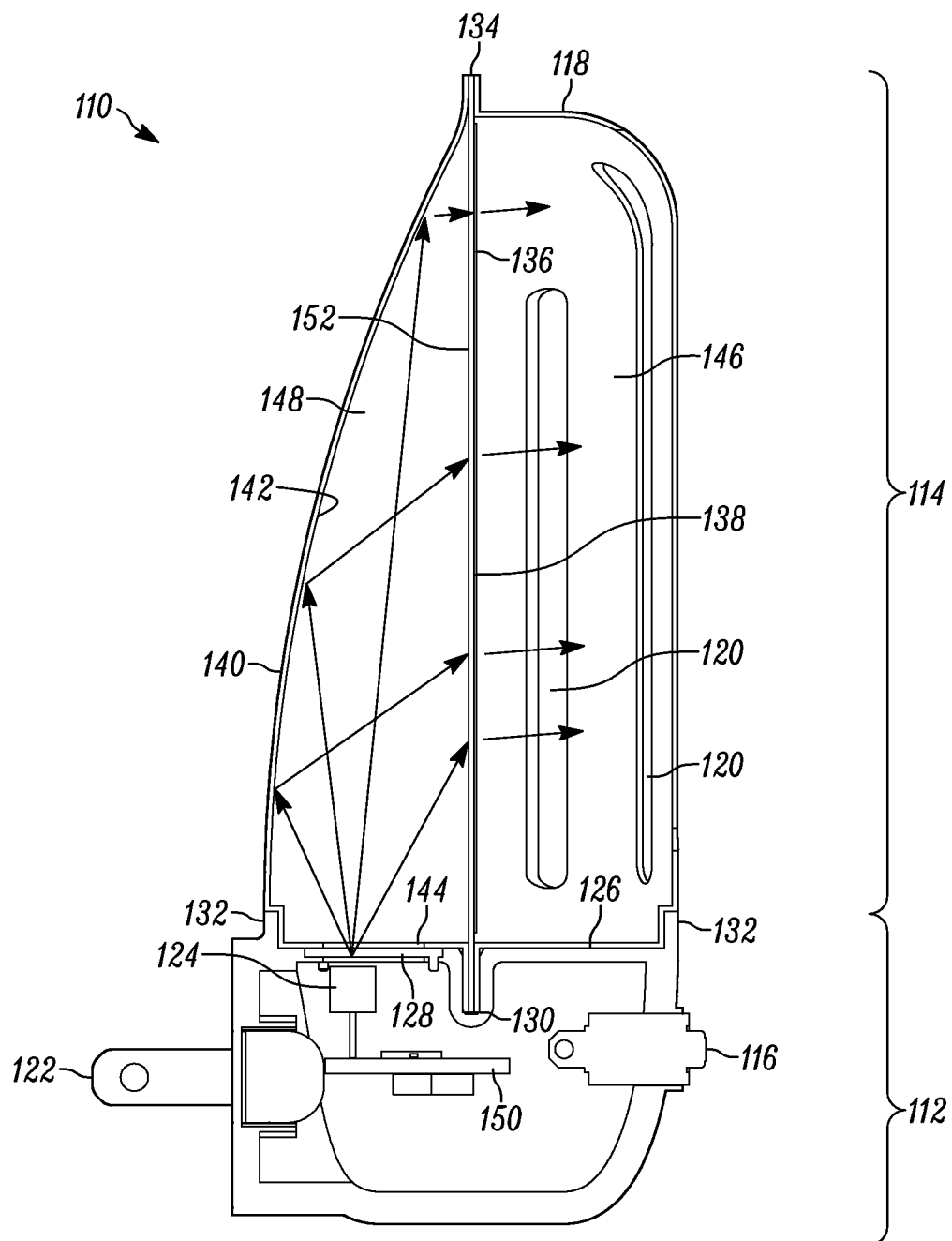


Fig. 4

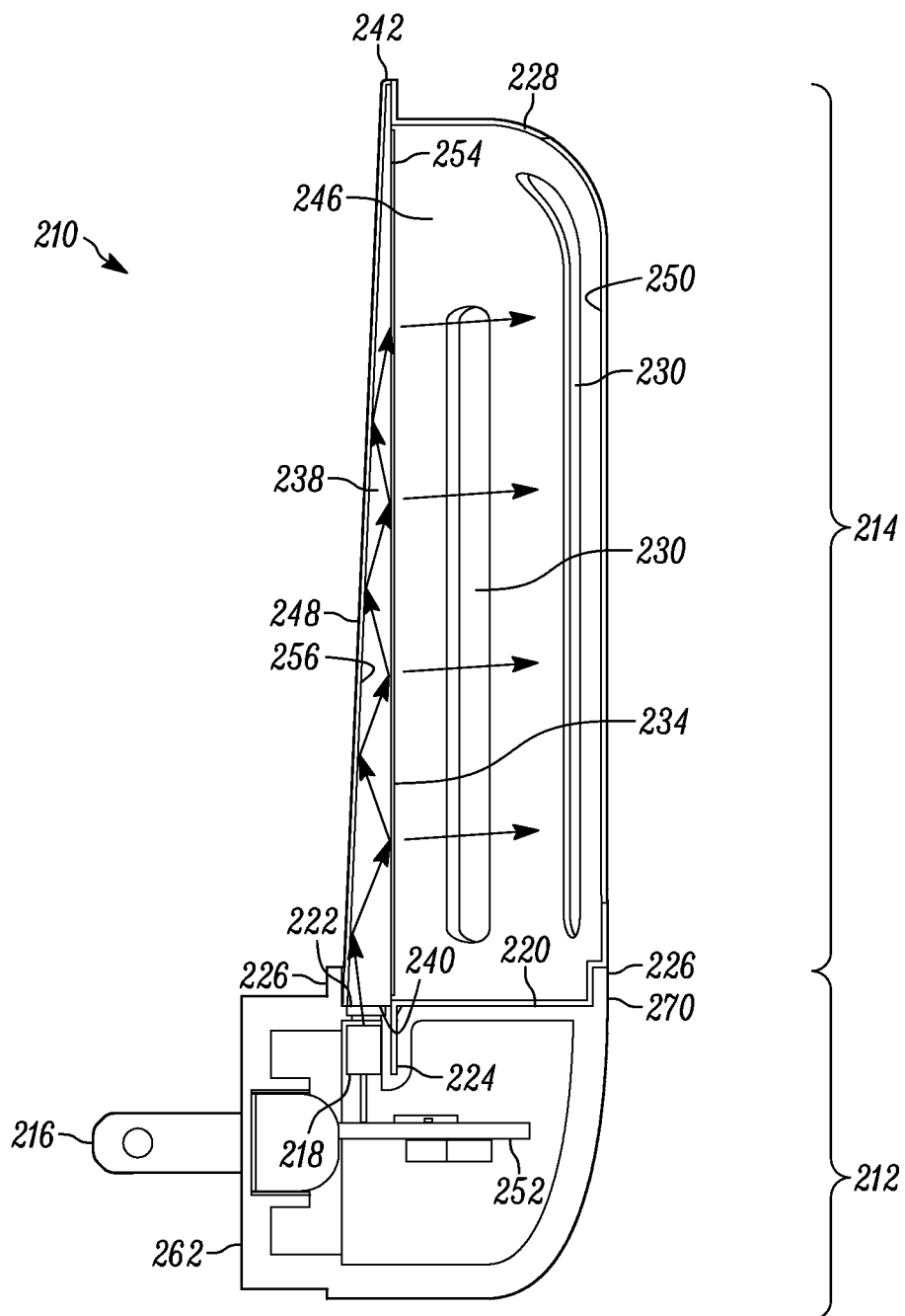


Fig. 5

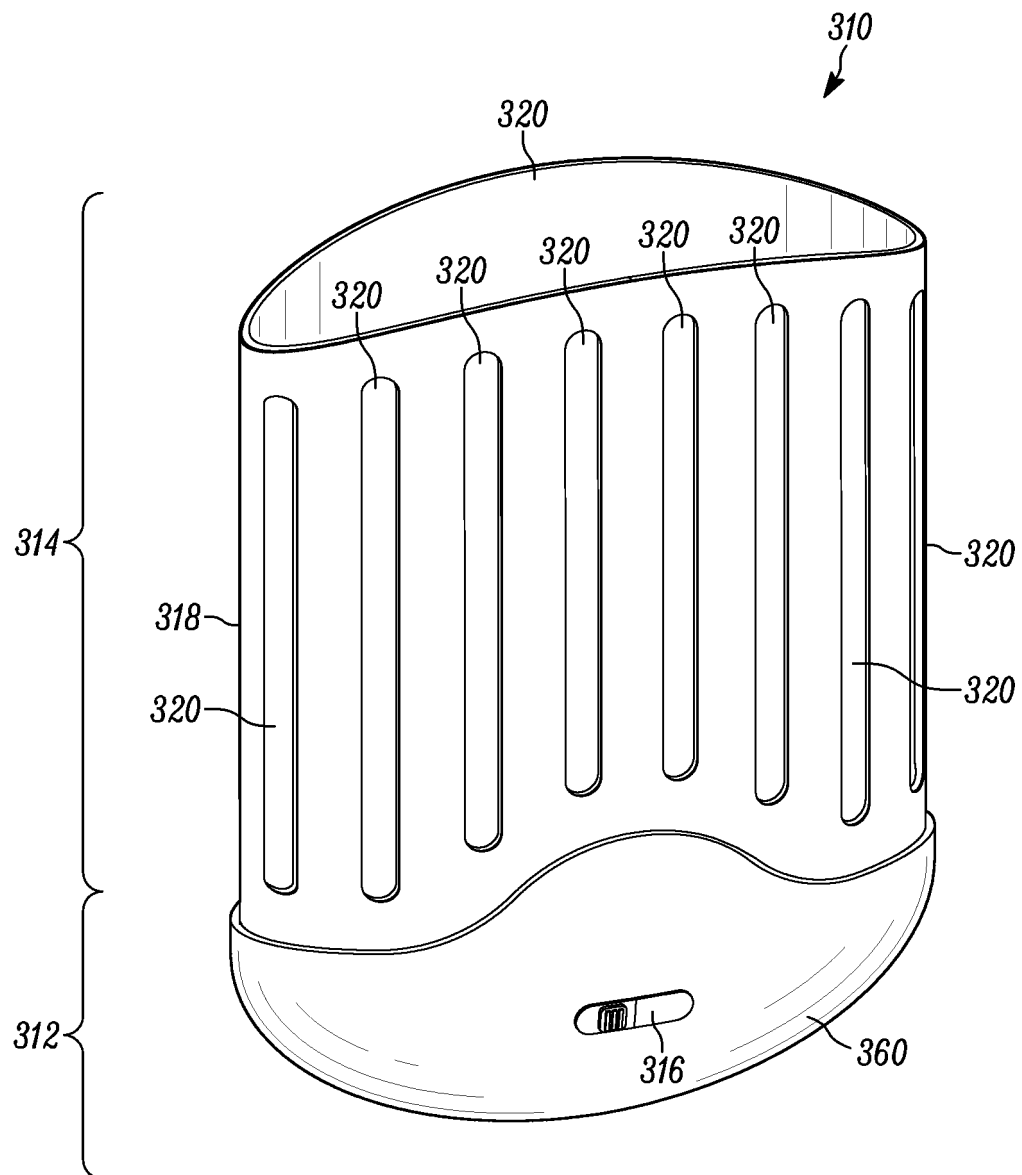


Fig. 6

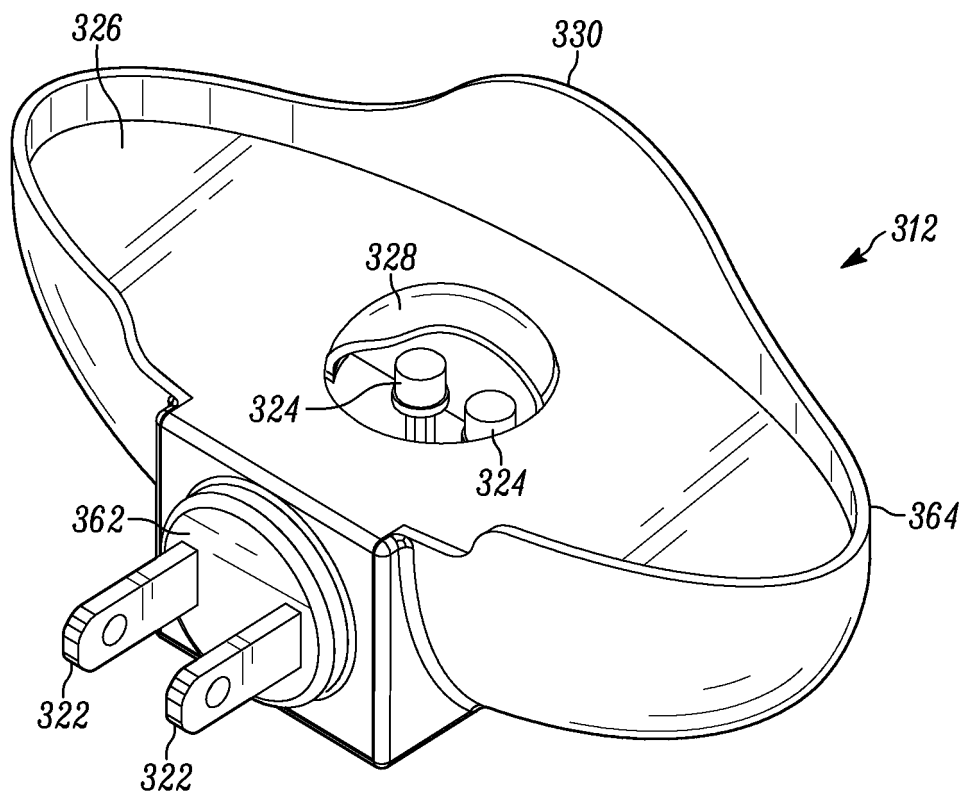


Fig. 7

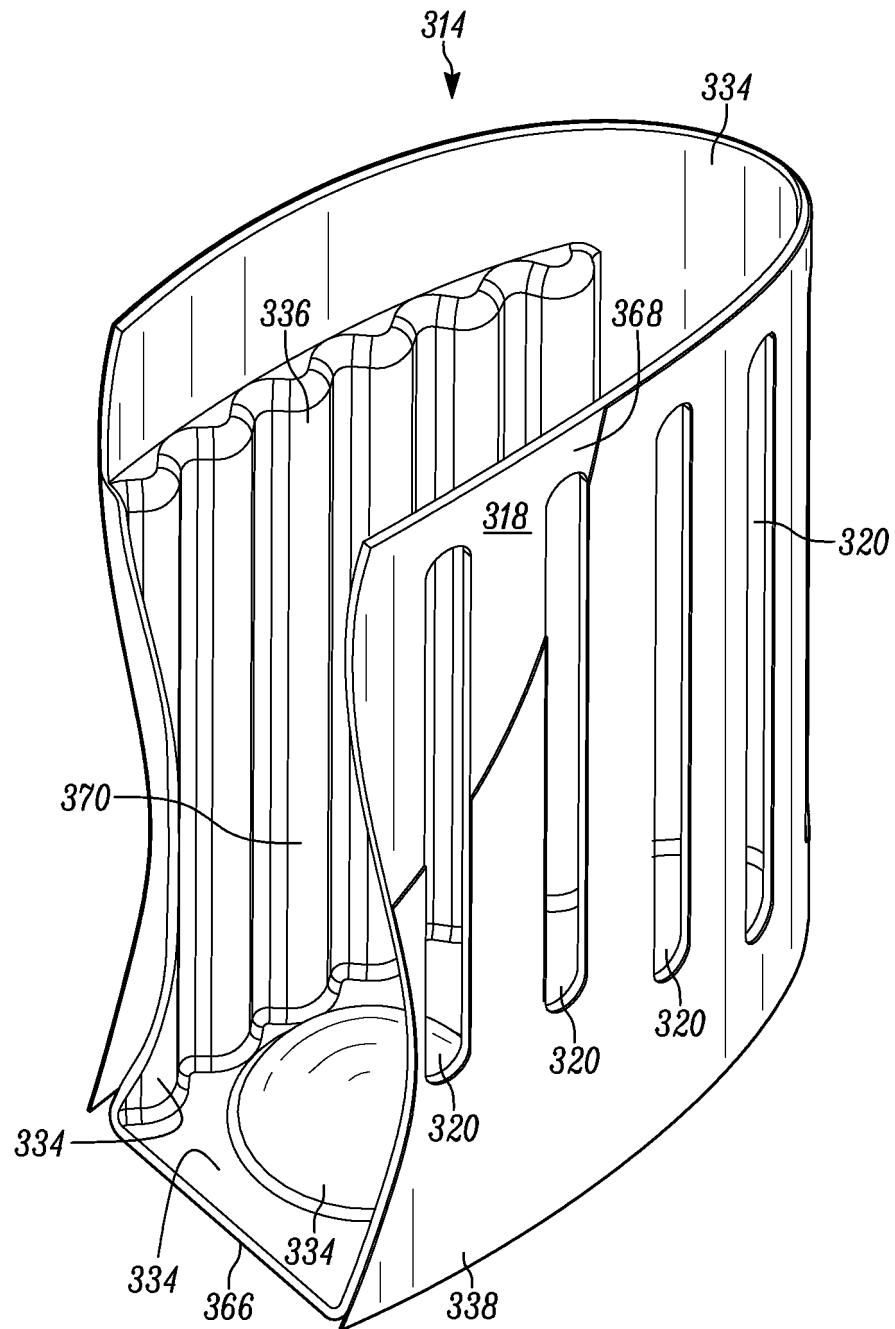


Fig. 8

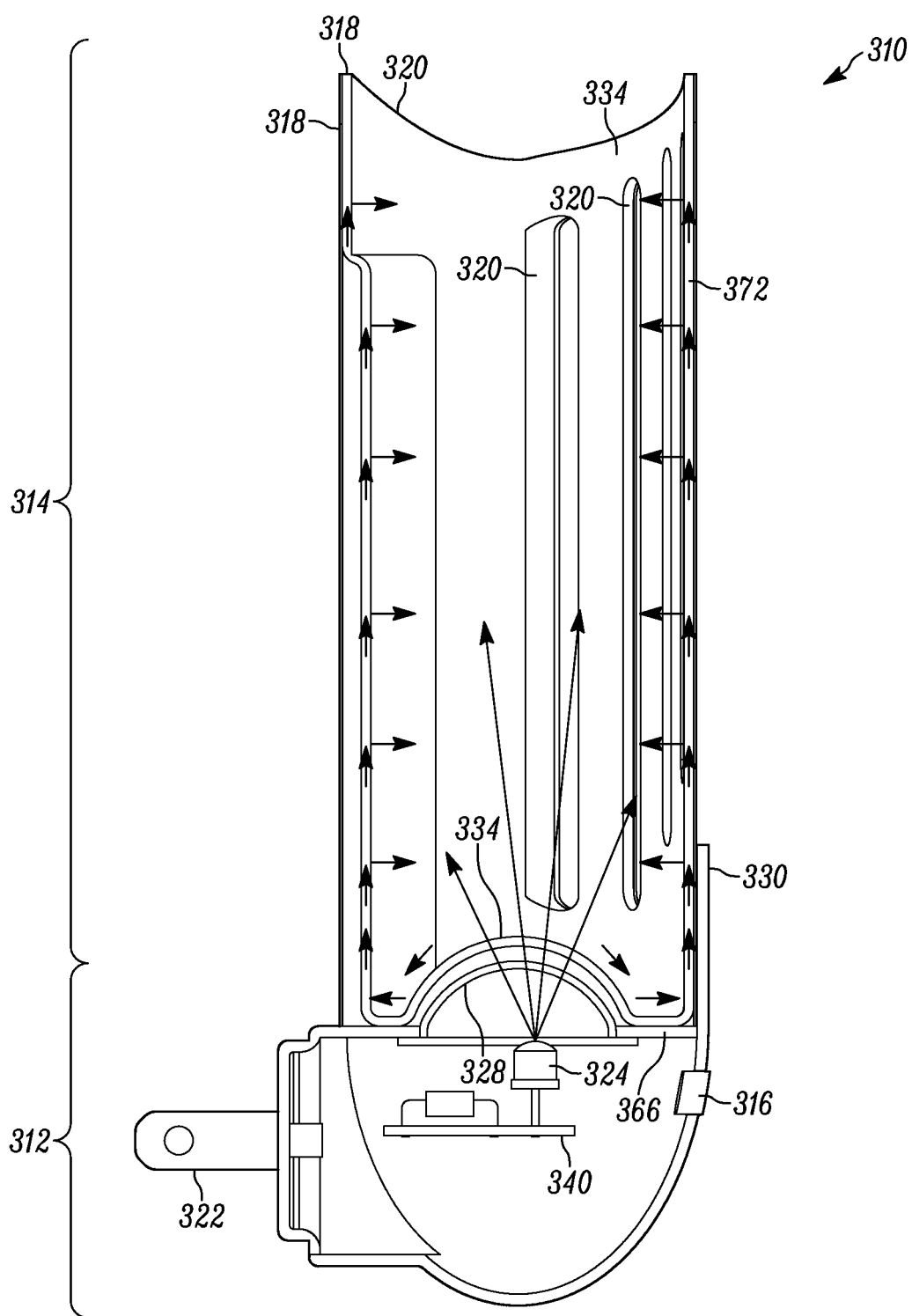
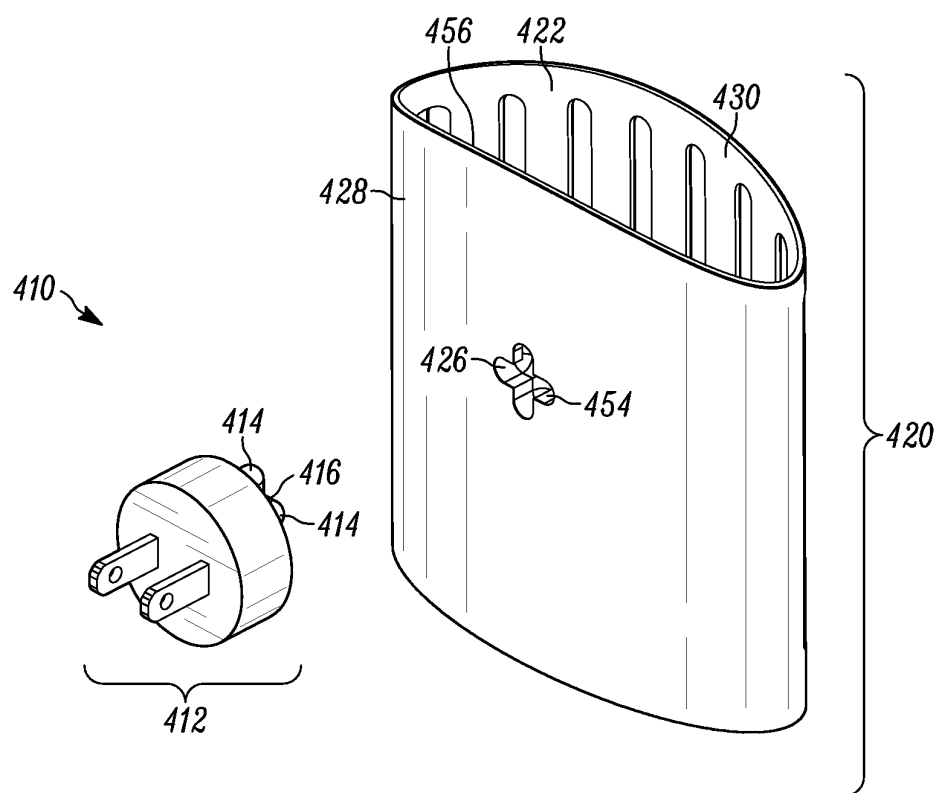
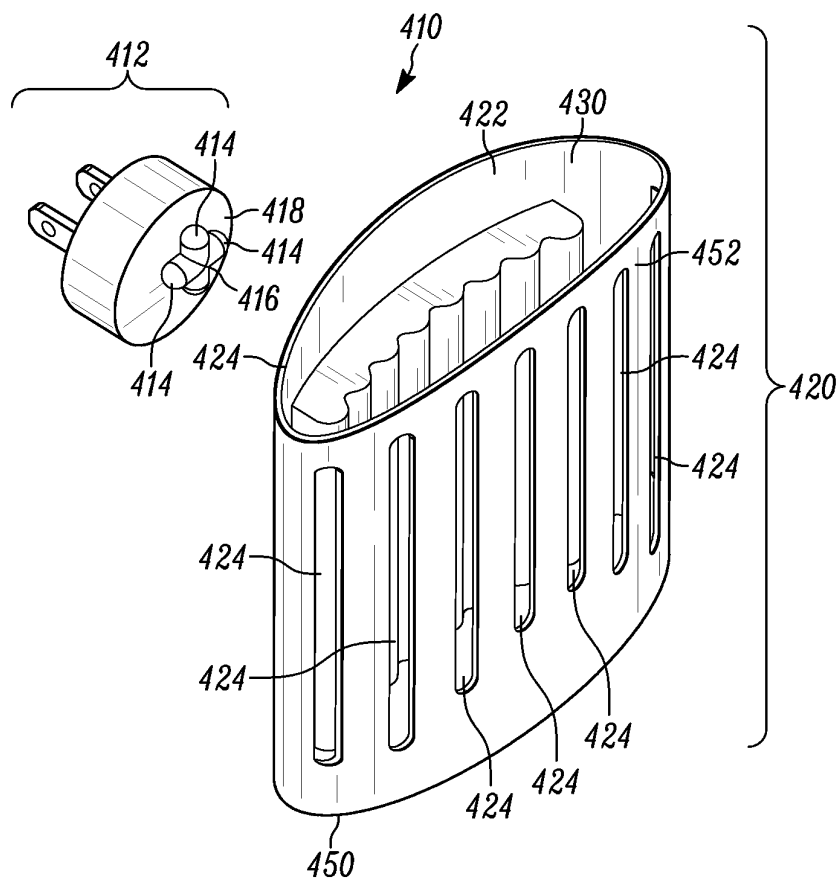


Fig. 9



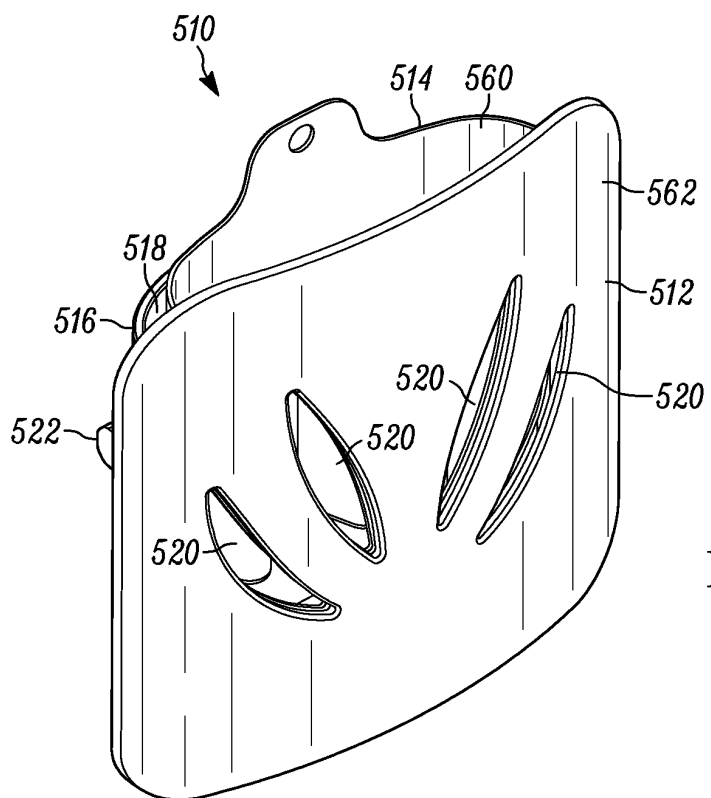


Fig. 12

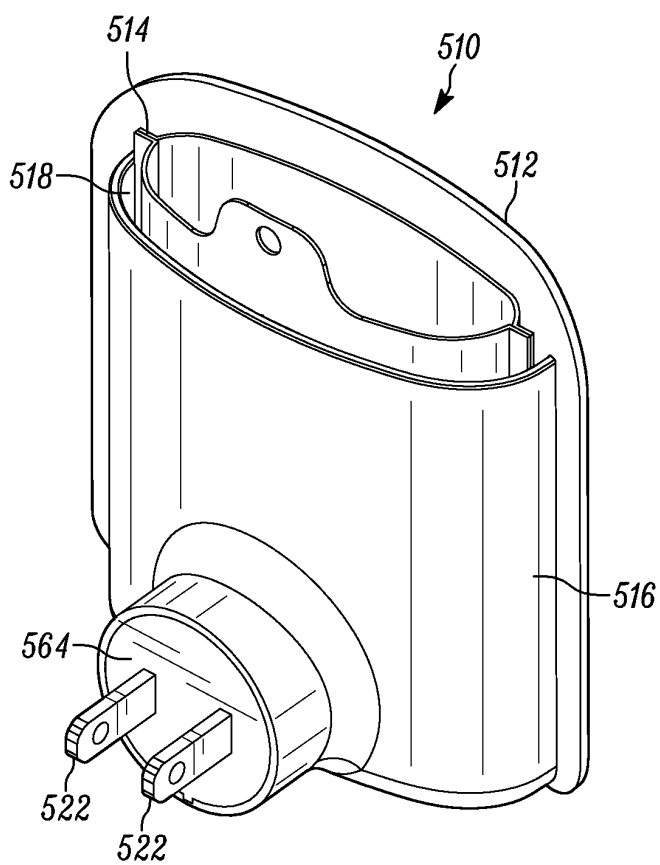


Fig. 13

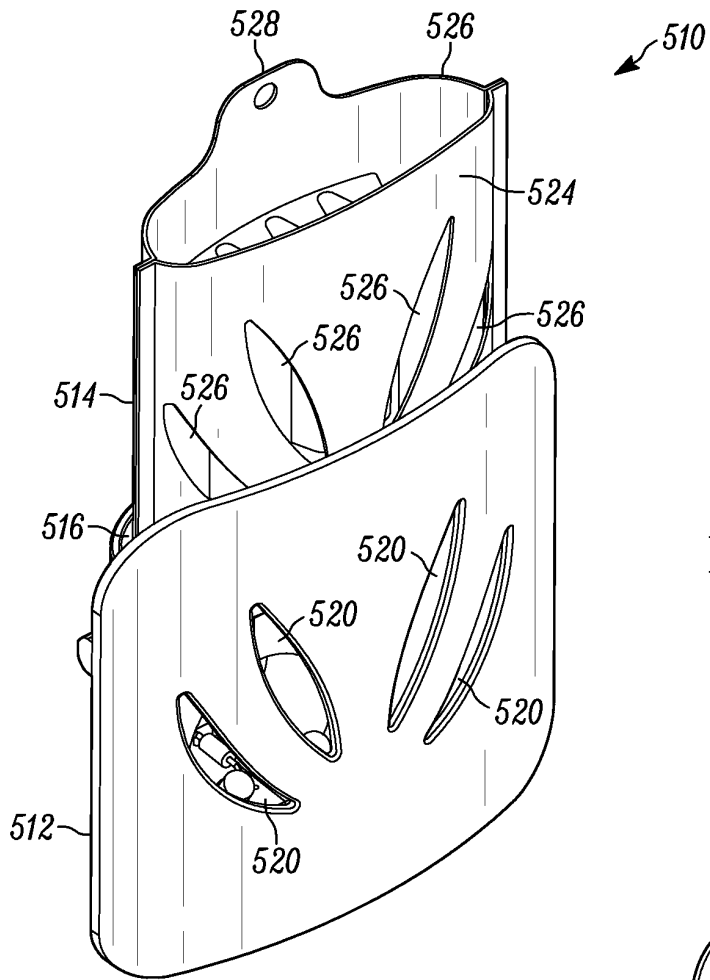


Fig. 14

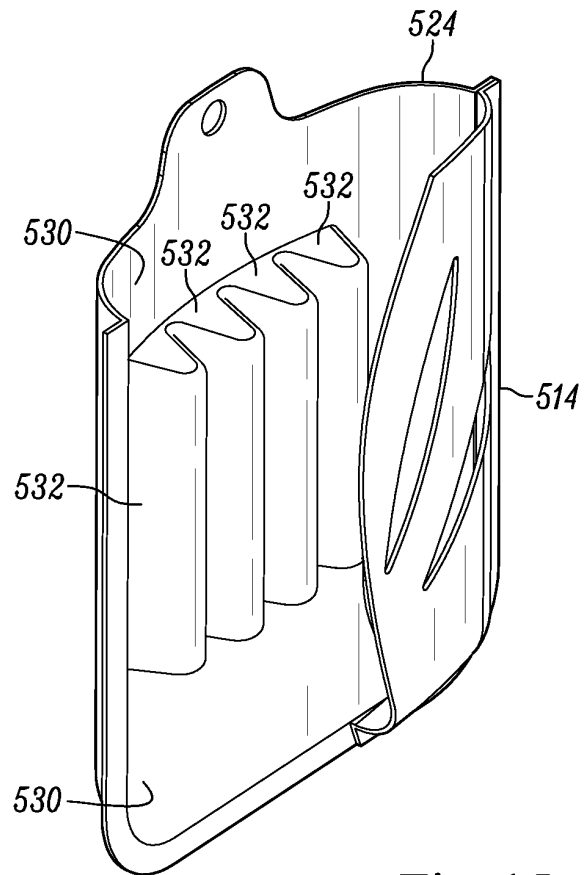


Fig. 15

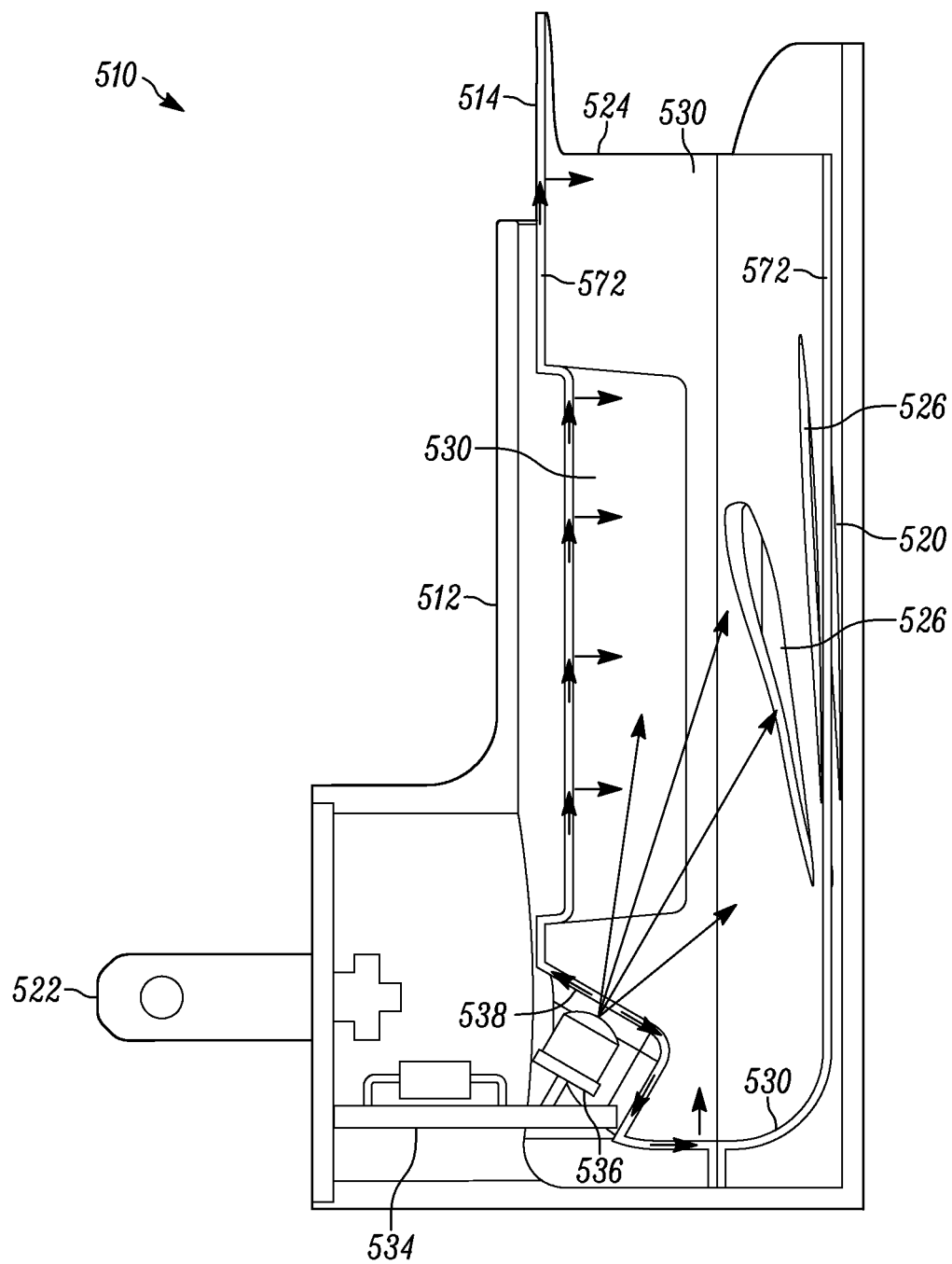


Fig. 16

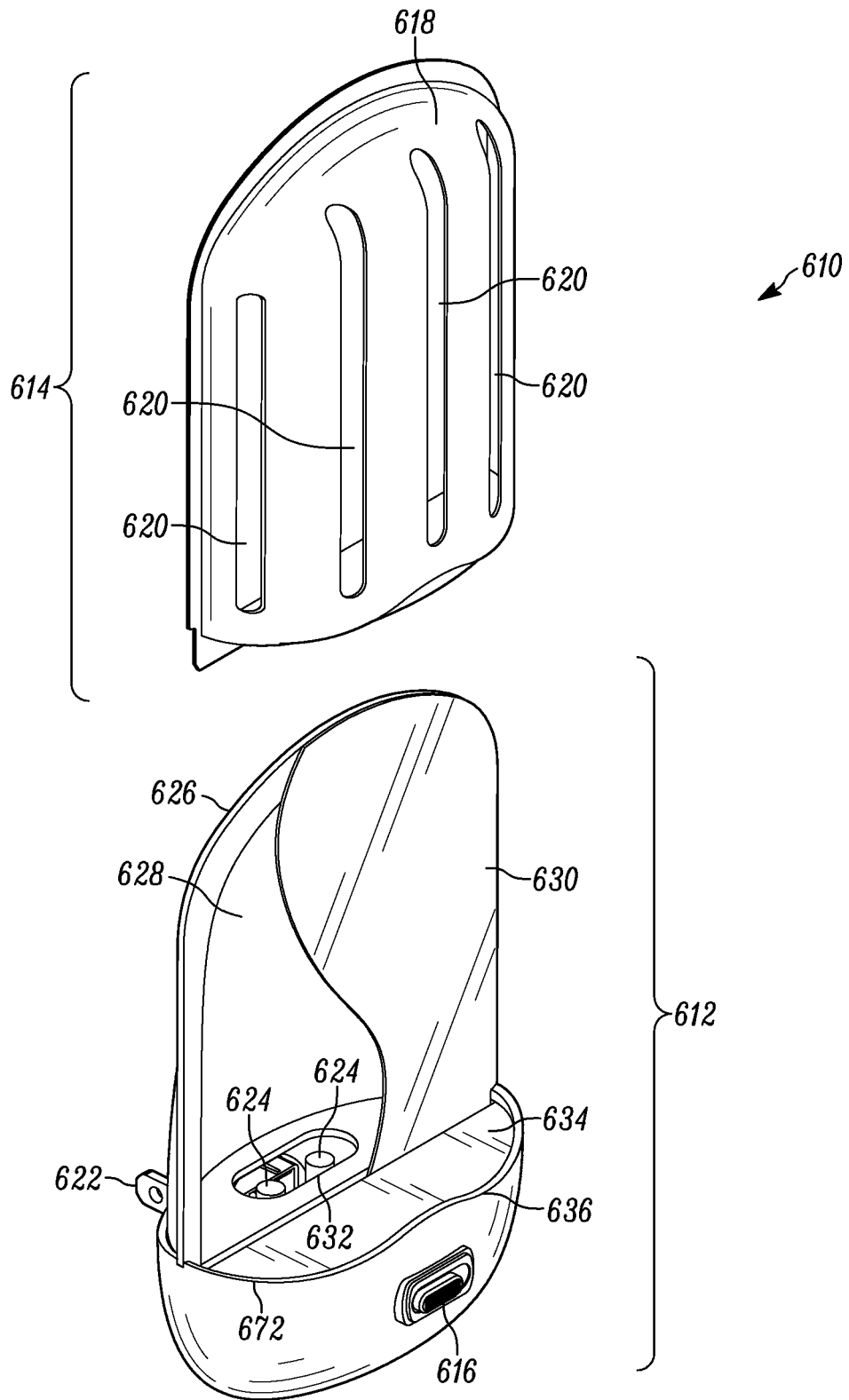


Fig. 17

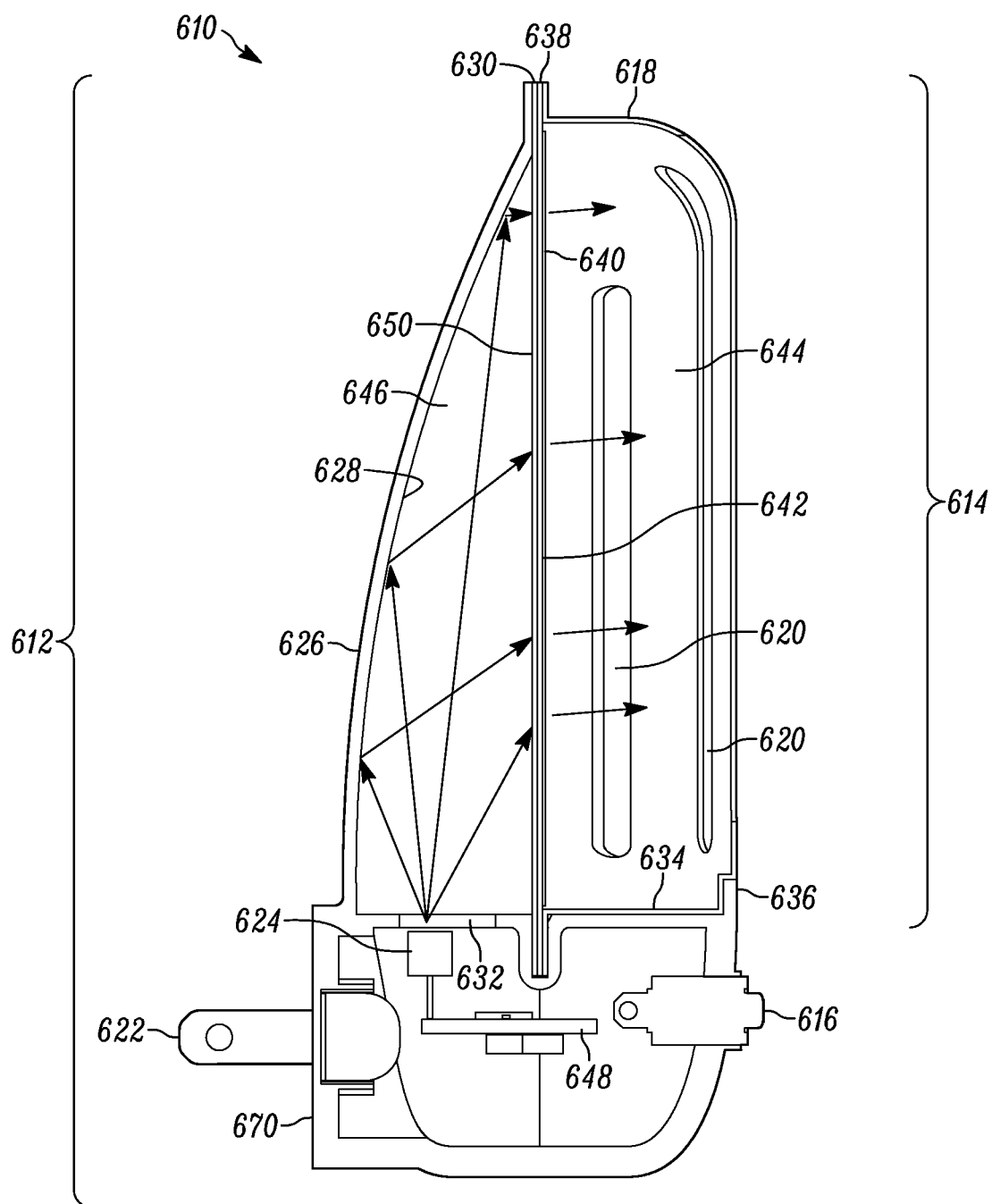


Fig. 18

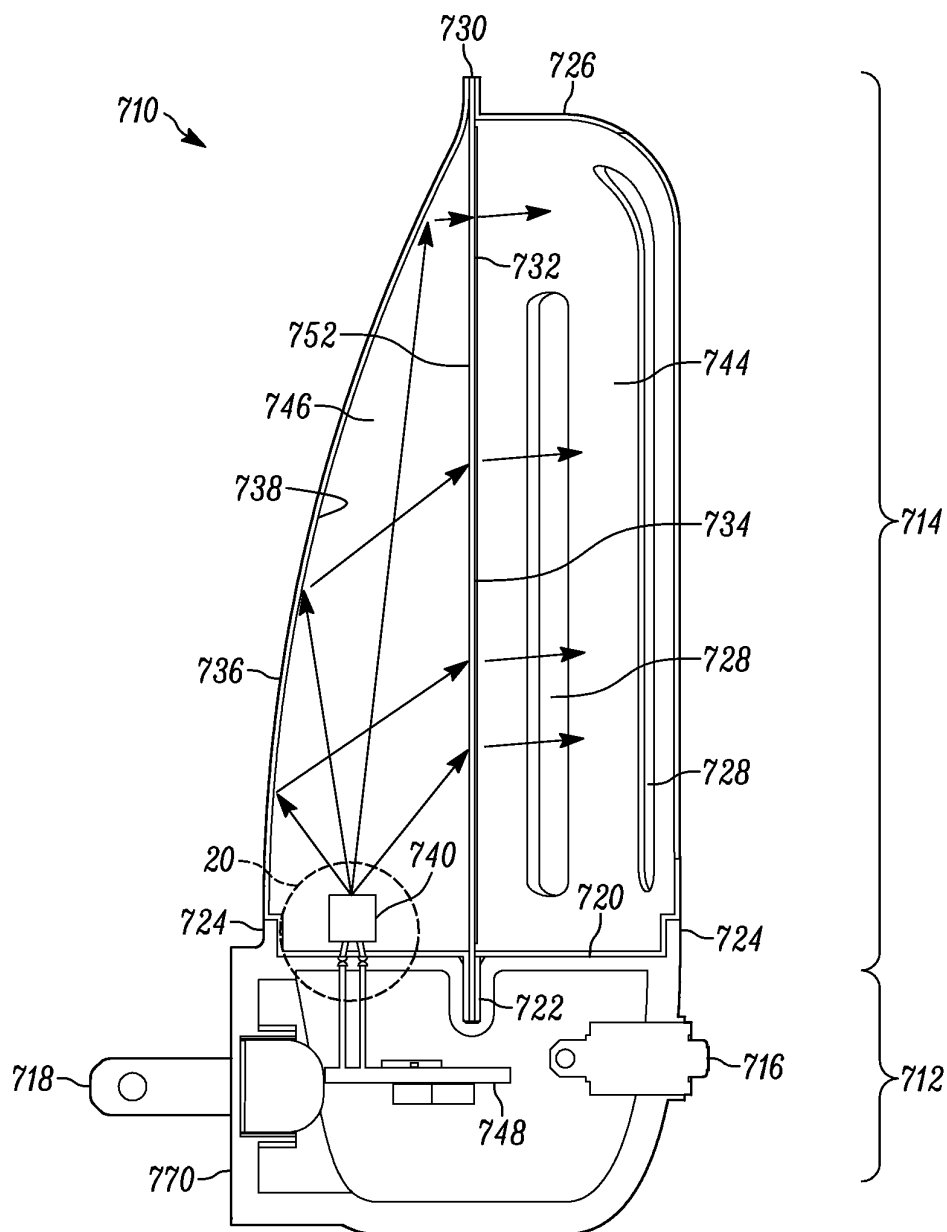


Fig. 19

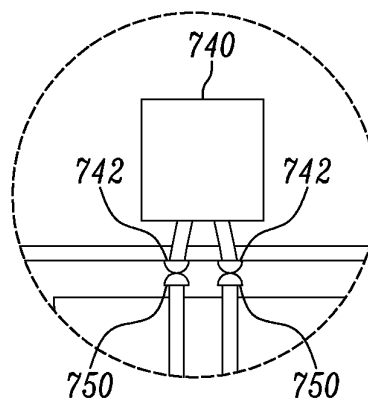


Fig. 20

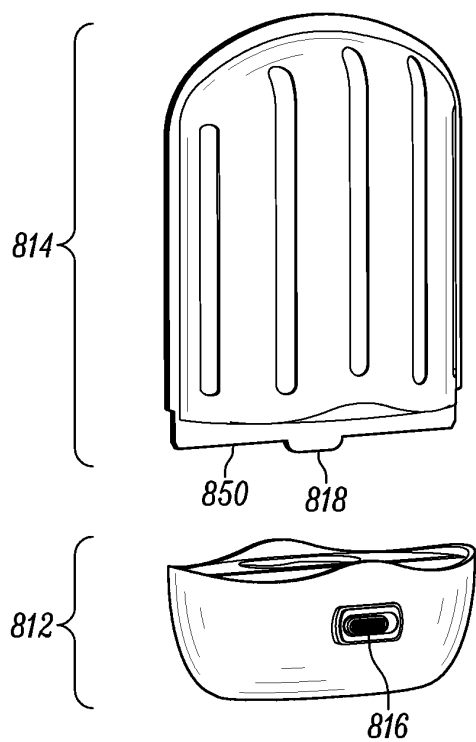


Fig. 21

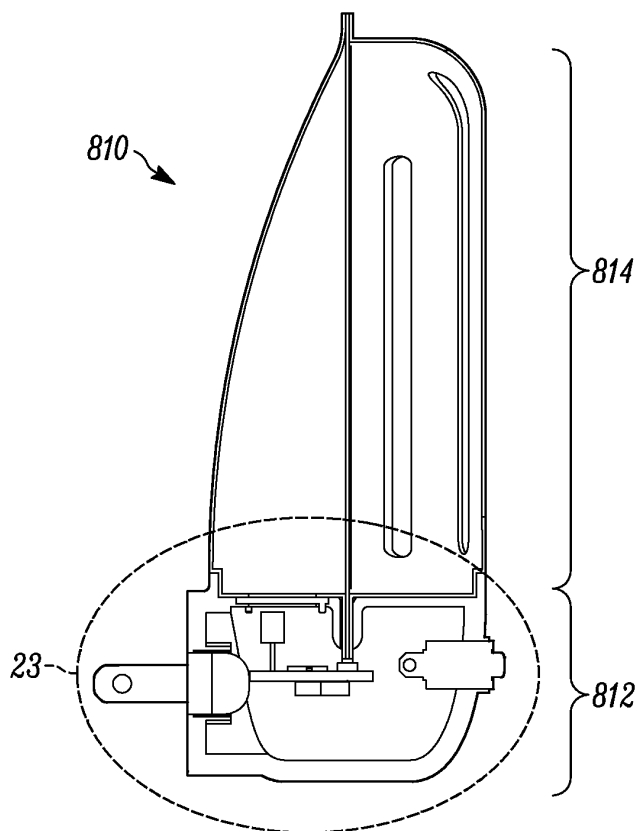


Fig. 22

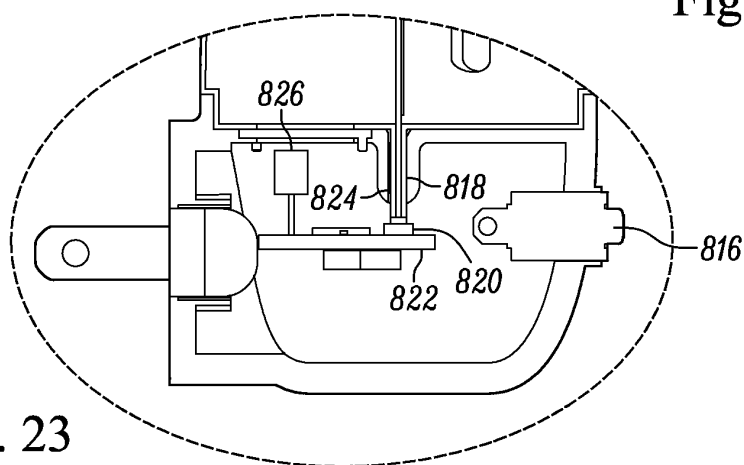


Fig. 23

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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